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AUTHOR

INPUT Seminar on the Scientific
and Engineering Marketplace for

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ON THE
SCIENTIFIC AND ENGINEERING MARKETPLACE
FOR
REMOTE COMPUTING SERVICES VENDORS

PREPARED FOR
IBM CORPORATION

APRIL 7, 1981

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AGENDA

APRIL 7, 1981

- I. OVERVIEW OF REMOTE COMPUTING SERVICES (RCS) INDUSTRY.
- II. SCIENTIFIC AND ENGINEERING MARKET FOR RCS VENDORS.
- III. RCS STRATEGIES AND TACTICS RELATED TO SCIENTIFIC AND ENGINEERING MARKETS.
- IV. USER ANALYSIS AND REQUIREMENTS.
- V. QUESTIONS AND ANSWERS.

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OVERVIEW
OF THE
REMOTE COMPUTING INDUSTRY

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KEY RCS DRIVING FORCES

- INCREASING USER DEMAND FOR ON-LINE ACCESS TO CORPORATE DATA
 - ACROSS INDUSTRY SECTORS 17% OF COMPUTING RESOURCES ARE AVAILABLE FOR NEW APPLICATIONS DEVELOPMENT
 - 45% OF PROGRAMMING PERSONNEL RESOURCES ARE AVAILABLE FOR NEW APPLICATIONS DEVELOPMENT
- APPLICATIONS BACKLOG FOR NEW AND ENHANCED APPLICATIONS SOFTWARE IS A MAJOR DRIVING FORCE FOR RCS REVENUE GROWTH

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KEY RCS DRIVING FORCES (CONT.)

- LARGE, MULTI-LOCATION COMPANIES ARE SEEKING NEW APPLICATIONS BASED UPON COMMUNICATION NETWORKS
 - FINANCIAL DATA CONSOLIDATIONS
 - DISTRIBUTED DATA ENTRY AND REPORTING
- INSTALLATION OF IN-HOUSE DBMS PROVIDES "SOURCE" DATA FOR RCS INFORMATION ANALYSIS APPLICATIONS
- IN-HOUSE COMPUTER SERVICES CONSTRAINED TO MAINTAINING AND ENHANCING BATCH SOFTWARE AND SYSTEMS
 - CONVERSIONS OF BATCH APPLICATIONS TO "ON LINE" IS SLOW AND LIMITED
 - MAKE vs. BUY (CUSTOMIZE)
- PROLIFERATION OF "MINI" COMPUTERS AND TURNKEY SYSTEMS
 - COMPETITIVE FORCE IN TRADITIONAL RCS MARKETS

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KEY RCS DRIVING FORCES (CONT.)

- **LARGE COMPANIES ARE SEEKING COMPUTER AIDS TO IMPROVE PLANNING AND ANALYSIS**
 - "WHAT IF" ANALYSIS
 - GRAPHIC REPRESENTATION OF CORPORATE DATA

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MAJOR RCS TRENDS

- DISTRIBUTED DATA PROCESSING OPPORTUNITIES
FORCE ENHANCEMENTS TO TRADITIONAL OFFERINGS
 - USER SITE HARDWARE
 - DISTRIBUTED WORKSTATIONS
 - "FIXED-PRICE" PACKAGING
- USER SITE HARDWARE ESTABLISHED MIGRATION PATH
FOR CUSTOMER BASE
 - MAJOR ACCOUNTS (FORTUNE 1300) ARE
DEMANDING MORE COST-EFFECTIVE SERVICES
 - REVENUE CONCENTRATION IN MAJOR ACCOUNTS
FORCES DEFENSIVE STRATEGY IN SHORT-TERM

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MAJOR RCS TRENDS (CONT.)

- USER LOW SPEED TERMINAL EVOLVING INTO WORKSTATION CONCEPTS
 - LOCAL DATA ENTRY/VALIDATION
 - ENTRY POINT FOR FAMILY OF SERVICES
- RCS VENDORS WILL BE CHANGING INDEPENDENT, CASUAL ATTITUDE TOWARD USER TERMINAL VENDOR SELECTION
 - MULTI-TERMINAL CUSTOMERS ARE BEING COURTED BY TERMINAL VENDOR TURNED DDP SUPPLIER
- PROFESSIONAL SERVICES AS A PERCENT OF TOTAL RCS REVENUES IS INCREASING
 - USERS SEEKING A "TURNKEY" SOLUTION
 - LACK OF AVAILABLE IN-HOUSE PROGRAMMING RESOURCES

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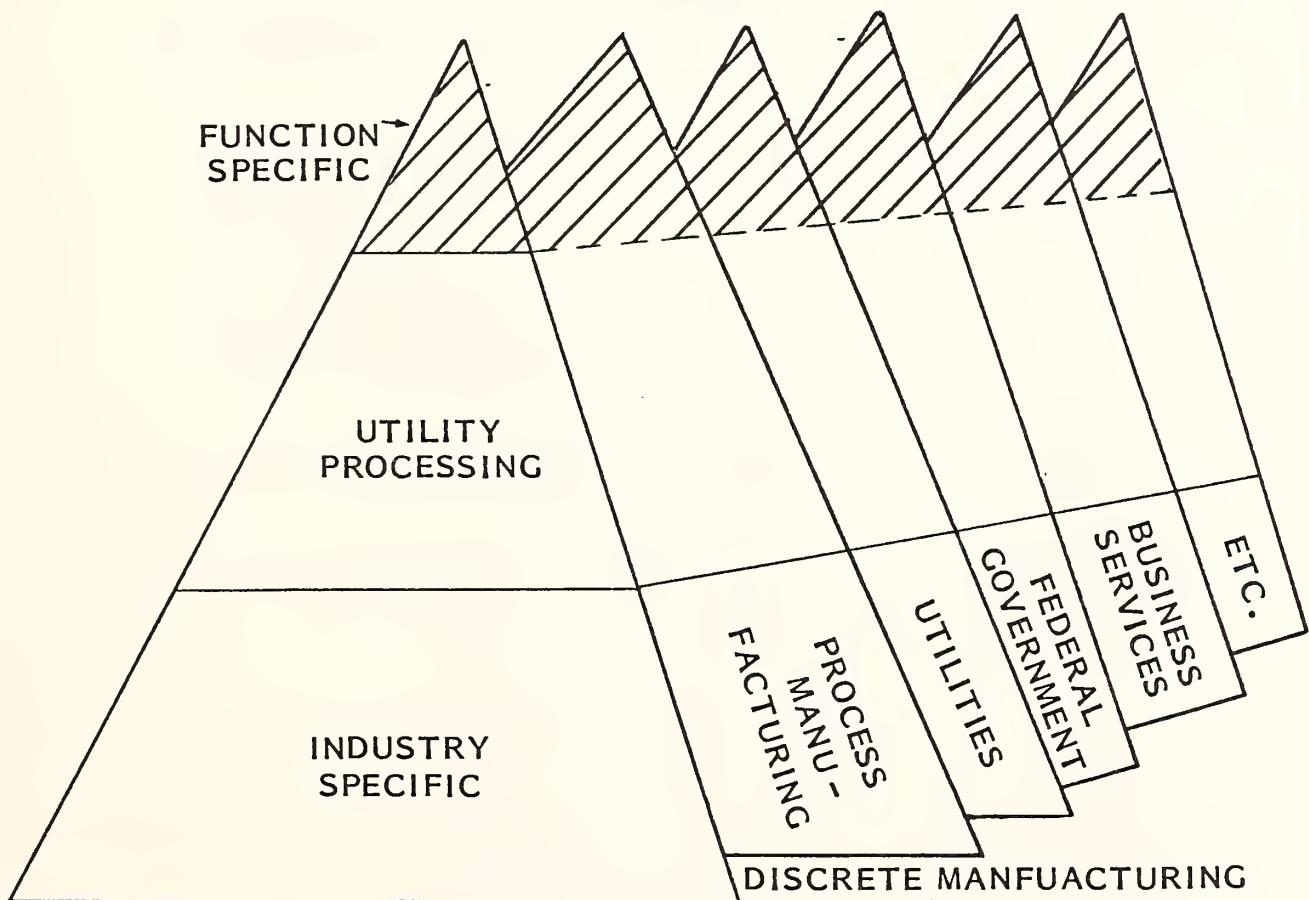
MAJOR RCS TRENDS (CONT.)

- PROPRIETARY DBMS USAGE IS MAJOR REVENUE STRATEGY
 - DBMS EMERGING AS "KERNEL" FOR APPLICATION SPECIALIZATION
- INTEGRATED PLANNING AND ANALYSIS SYSTEMS UNDER DEVELOPMENT COMBINING:
 - DBMS
 - FORECASTING/MODELING LANGUAGES
 - GRAPHICS

INTO A COMMON "USER FRIENDLY" COMMAND LANGUAGE ENVIRONMENT.

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TYPES OF PROCESSING SERVICES



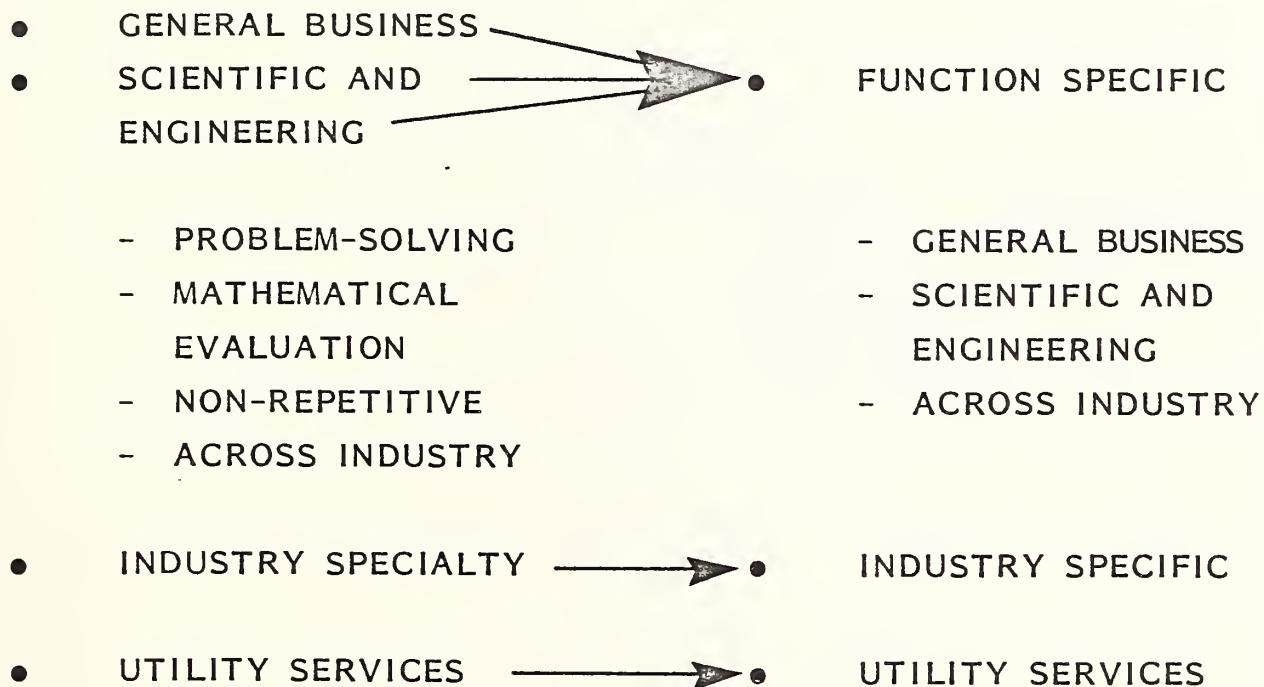
- FUNCTION SPECIFIC AND UTILITY PROCESSING
 - ACROSS INDUSTRIES
- INDUSTRY SPECIFIC
 - UNIQUE TO INDUSTRY

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SCIENTIFIC AND ENGINEERING RECATEGORIZATION

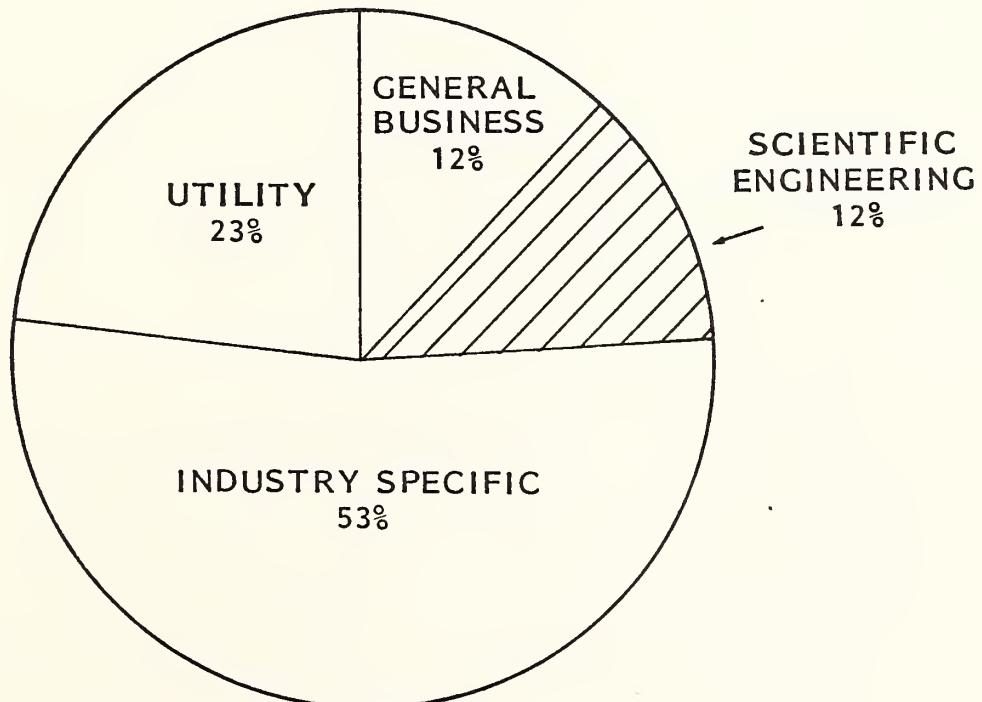
1979

1980



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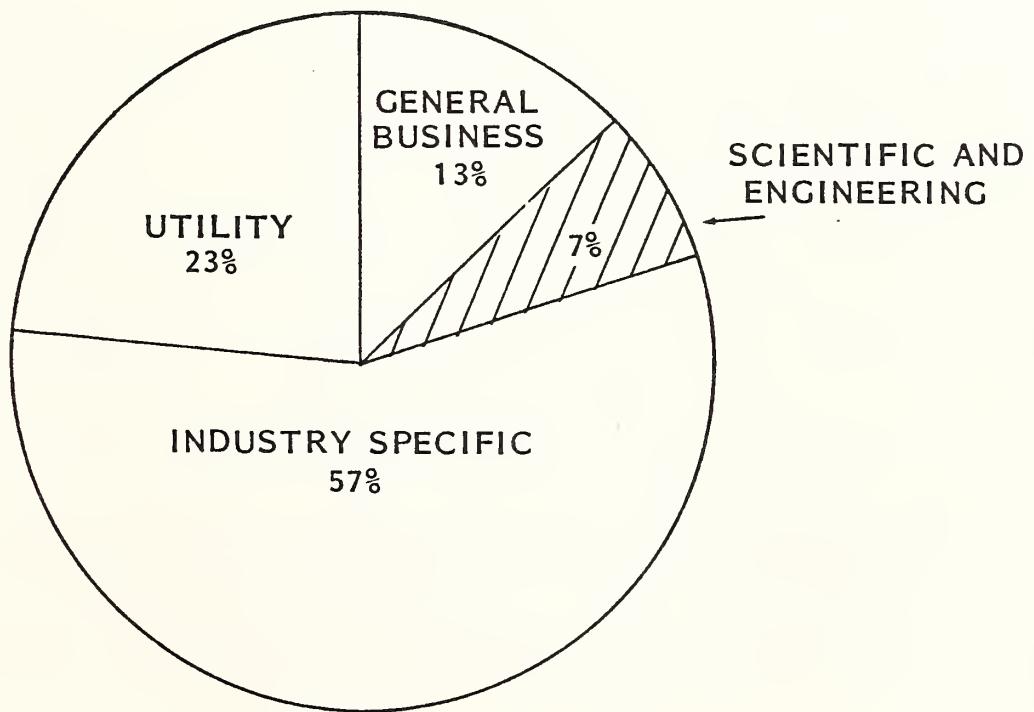
RCS MARKET SEGMENTATION BY TYPE OF SERVICES 1980-1985



\$4.27 BILLION
RCS MARKET
1980

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RCS MARKET SEGMENTATION BY TYPE OF SERVICES 1980-1985 (Cont.)



\$11.45 BILLION
RCS MARKET
1985

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REMOTE COMPUTING MARKET FORECAST BY TYPE OF SERVICE 1980-1985 (\$ MILLION)

REMOTE COMPUTING SERVICES	1980	1981	1982	1983	1984	1985	AAGR 1980-1985 PER-CENT
FUNCTION SPECIFIC	940	1,120	1,340	1,580	1,890	2,270	19%
• GENERAL BUSINESS	550	660	800	950	1,160	1,430	
• SCIENCE AND ENGINEERING	390	460	540	630	730	840	
INDUSTRY SPECIFIC	2,310	2,840	3,530	4,350	5,360	6,640	23
UTILITY	1,020	1,220	1,460	1,760	2,100	2,540	20
TOTAL	4,270	5,180	6,330	7,690	9,350	11,450	22%

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THE LARGEST VENDORS OF RCS 1979

TOTAL RCS REVENUE RANK	COMPANY	SCIENTIFIC AND ENGINEERING REVENUE RANK
1	CONTROL DATA CORPORATION	1
2	GENERAL ELECTRIC INFORMATION SERVICE	3
3	AUTOMATIC DATA PROCESSING	9
4	TYMSHARE	7
5	COMPUTER SCIENCES CORPORATION	8
6	UNITED INFORMATION SYSTEMS	2
7	NATIONAL CSS	5
8	TRW	-
9	McDONNELL DOUGLAS AUTOMATION	6
10	BRADFORD NATIONAL	-
11	XEROX COMPUTER SERVICES	-
12	BOEING COMPUTER SERVICES	4
13	CHASE MANHATTEN BANK	-
14	QUOTRON	-
15	A.C. NIELSON	-

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SCIENTIFIC AND ENGINEERING MARKET
FOR
REMOTE COMPUTING SERVICE VENDORS

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KEY SCIENTIFIC AND ENGINEERING DRIVING FORCES

ENVIRONMENTAL

- REINDUSTRALIZATION OF AMERICAN FACTORIES WILL INCREASE DEMAND FOR ENGINEERING APPLICATIONS
 - COST REDUCTION VIA PRODUCTIVITY IMPROVEMENTS INCREASING
- REAGAN ADMINISTRATION WILL FUND INCREASING DEPT. OF DEFENSE EXPENDITURES ON SCIENTIFIC AND ENGINEERING APPLICATIONS
- EXPLORATION AND DEVELOPMENT OF ALTERNATIVE ENERGY SOURCES
- RESEARCH AND DEVELOPMENT BUDGETS WILL BE INCREASED TO MEET FOREIGN COMPETITION IN TRADITIONAL U.S. MARKETS
 - AUTO
 - CONSUMER ELECTRONICS
 - INDUSTRIAL ELECTRONICS
 - COMPUTERS/PERIPHERALS

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KEY SCIENTIFIC AND ENGINEERING DRIVING FORCES (Cont.)

TECHNOLOGY

- COMPUTER-AIDED DESIGN FACILITATES IMPROVED ENGINEERING PRODUCTIVITY, PRODUCT QUALITY AND RELIABILITY
 - GREATEST DEMAND FOR CAD SYSTEM IS IN ELECTRICAL AND ELECTRONIC CIRCUIT DESIGN

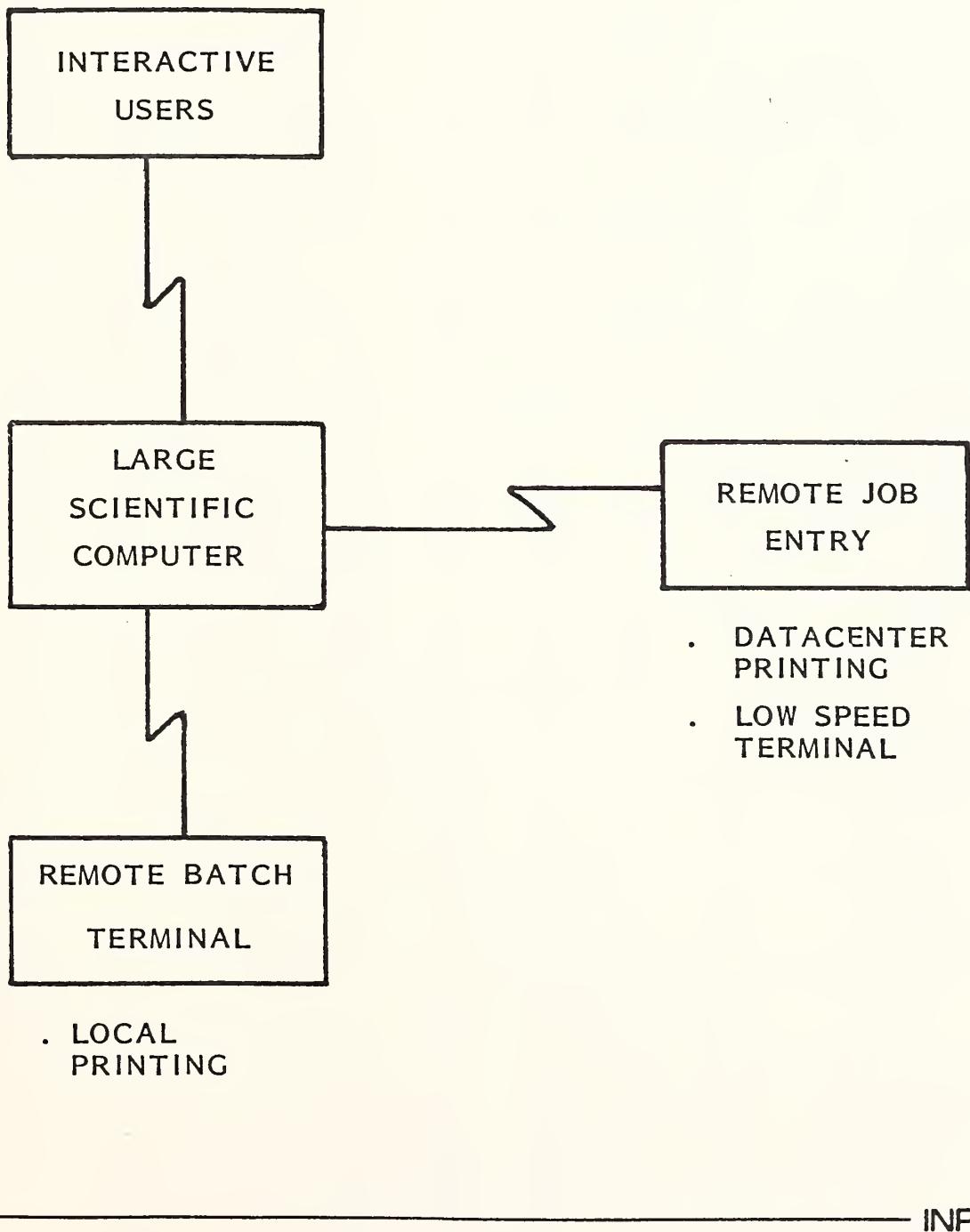
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SCIENTIFIC AND ENGINEERING MARKET DEFINITION

- PROCESSING BY MEANS OF TERMINALS AT USER'S SITE(S) CONNECTED BY A DATA COMMUNICATIONS NETWORK TO THE VENDOR'S CENTRAL COMPUTER TO SOLVE SCIENTIFIC AND ENGINEERING PROBLEMS.
 - ACROSS INDUSTRIES
 - PROJECT-ORIENTED
 - NON-REPETITIVE
 - SOLUTION OF MATHEMATICAL EQUATIONS
 - HIGH COMPUTE, LOW INPUT/OUTPUT
 - MIXED MODE
 - . INTERACTIVE
 - . REMOTE BATCH

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MODES OF DELIVERY

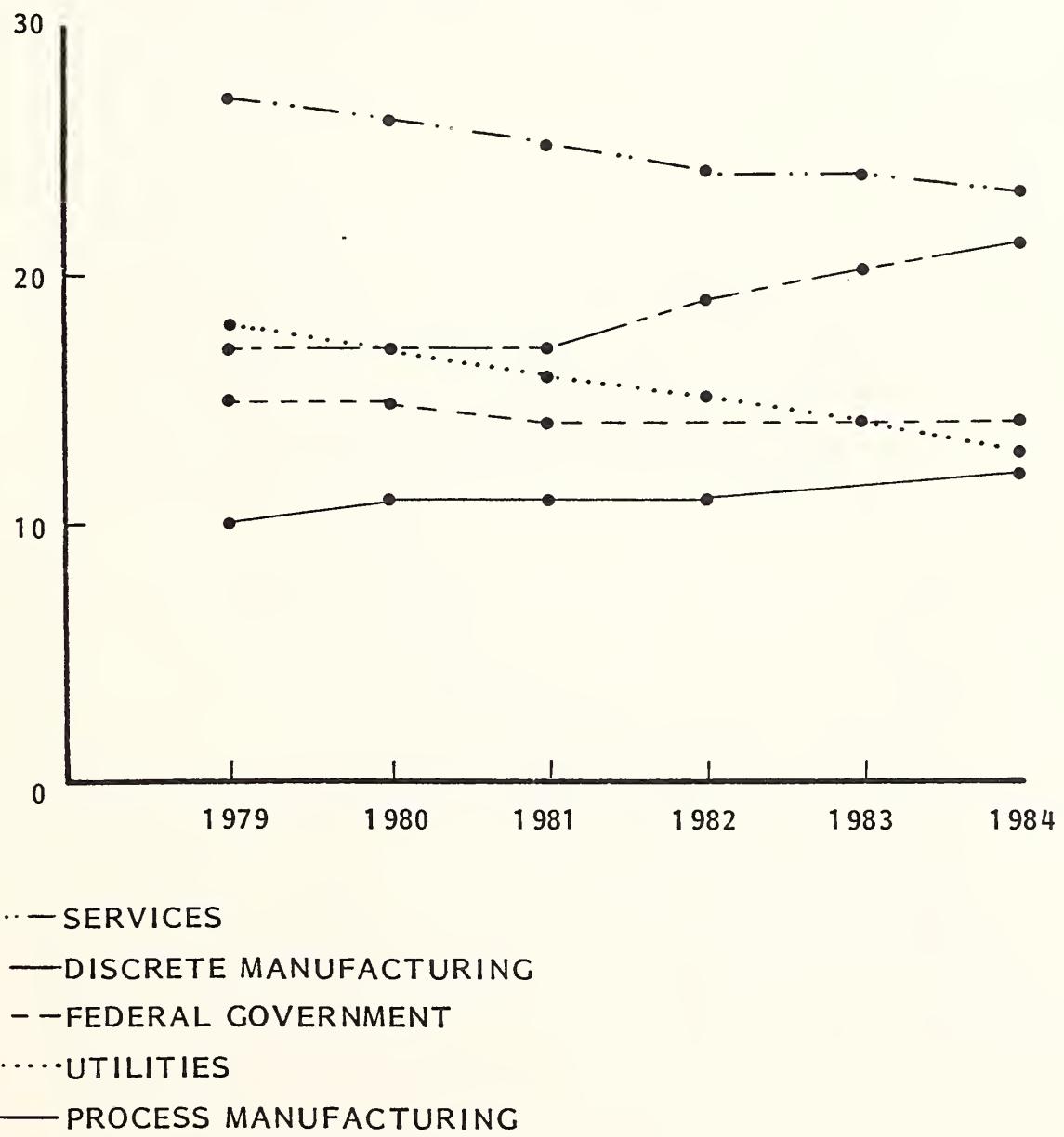


**REMOTE COMPUTING SERVICES - SCIENTIFIC AND ENGINEERING FORECAST
BY SIGNIFICANT INDUSTRY SECTOR 1979-1984**

	1979 (\$M)	TO- TAL (%)	1980 (\$M)	TO- TAL (%)	1981 (\$M)	TO- TAL (%)	1982 (\$M)	TO- TAL (%)	1983 (\$M)	TO- TAL (%)	1984 (\$M)	TO- TAL (%)	AAGR 1979- 1984 (%)
SERVICES	\$ 91	27%	\$102	26%	\$114	25%	\$130	24%	\$149	24%	\$168	23%	13%
DISCRETE MANUFACTUR- ING	60	18	67	17	80	17	100	19	125	20	150	21	20
FEDERAL GOVERNMENT	58	17	66	17	74	16	83	15	92	14	101	14	12
UTILITIES	51	15	58	15	66	14	76	14	86	14	98	13	14
PROCESS MANUFACTUR- ING	34	10	43	11	50	11	60	11	72	11	86	12	20
OTHER INDUSTRIES	46	13	54	14	76	17	91	17	106	17	127	17	20
TOTAL	\$340	100%	\$390	100%	\$460	100%	\$540	100%	\$630	100%	\$730	100%	16%

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**INDUSTRY PERCENT OF TOTAL SCIENTIFIC AND
ENGINEERING MARKET**



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STRUCTURAL DESIGN ANALYSIS MARKET

- FASTEST GROWING SEGMENT OF THE S & E MARKET
 - 20 - 25% PER YEAR
- CDC AND McAUTO HAVE 50% OF THE MARKET
 - CDC'S SOFTWARE SUPPORT AND SCIENTIFIC COMPUTERS ARE THE KEY TO ITS DOMINANCE
 - McAUTO'S STRENGTH LIES WITH ITS STAFF OF EXPERIENCED ENGINEERS AND SPECIALIZED SOFTWARE
- PRIMARY PRODUCTS
 - NASTRAN
 - ANSYS
 - SDRC MECHANICAL DESIGN LIBRARY
 - STRUDL

INPUT

REMOTE COMPUTER PROCESSING SERVICES MARKETS FOR STRUCTURAL DESIGN ANALYSIS

- THE MARKET FOR STRUCTURAL DESIGN ANALYSIS COMPUTER SERVICES OF THE FORTUNE 1000 FIRMS CONSISTS OF 300 FIRMS ENGAGED IN THE FOLLOWING INDUSTRIES:
 - TRANSPORTATION EQUIPMENT
 - AIRCRAFT
 - AGRICULTURAL EQUIPMENT AND MACHINERY
 - CONSTRUCTION EQUIPMENT AND MACHINERY
 - MANUFACTURING EQUIPMENT AND MACHINERY
 - MINING EQUIPMENT AND MACHINERY
 - POWER GENERATING EQUIPMENT AND MACHINERY
 - MACHINE TOOL MANUFACTURE
 - MARINE EQUIPMENT MACHINERY AND VEHICLES
 - METALWORKING
 - CHEMICAL PROCESSING EQUIPMENT MANUFACTURERS
 - MECHANICAL EQUIPMENT MANUFACTURERS

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NUMBER OF FORTUNE 1000 FIRMS
WHO ARE POTENTIAL USERS OF DESIGN ANALYSIS

TYPE OF INDUSTRY	NUMBER OF FIRMS TOP 500	NUMBER OF FIRMS SECOND 500
METAL MANUFACTURING	35	31
METAL PRODUCTS	26	45
SHIPBUILDING, RAILROAD & TRANSPORTATION EQUIPMENT	6	11
MOTOR VEHICLES	20	13
AEROSPACE	14	2
INDUSTRIAL AND FARM EQUIPMENT	45	52
TOTAL	146	154

TOTAL NUMBER OF PLANTS

INDUSTRY SIC	NAME OF MANUFACTURING INDUSTRY	TOTAL # OF PLANTS	TOTAL # OF LARGE PLANTS
33	METALWORKING (PRIMARY METALS)	4,213	1,981
355, 356	MANUFACTURING EQUIPMENT	3,855	1,331
354	MACHINE TOOLS	3,177	708
371, 374, 375, 379	TRANSPORTATION EQUIPMENT (EXCEPT AIRCRAFT & SHIPS)	2,218	1,048
353	CONSTRUCTION EQUIPMENT	1,545	624
372, 376	AIRCRAFT/SPACECRAFT	799	430
352	AGRICULTURAL EQUIPMENT	762	259
373	SHIP AND BOAT BUILDING	675	258
351, 361	POWER GENERATION EQUIPMENT	667	358
	TOTAL	17,911	6,997

TOTAL PLANTS = 20 OR MORE EMPLOYEES

LARGE PLANTS = 100 OR MORE EMPLOYEES

REFERENCE: ECONOMIC INFORMATION SYSTEMS

TYPES OF VENDOR SCIENTIFIC/ENGINEERING MARKET STRATEGIES

- **FULL-SERVICE STRATEGY.**
 - PROVIDE MAJOR ACCOUNTS S&E SOFTWARE IN ORDER TO RETAIN ACCOUNT CONTROL.
 - UTILITY PROCESSING.
- **INDUSTRY SPECIALIZATION STRATEGY.**
 - DOMINANT SUPPLIER.
- **UTILITY STRATEGY.**
 - CUSTOMERS PROVIDE SOFTWARE PROGRAMS.
 - VENDOR PROVIDES LOW COST MACHINES RESOURCES.

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**SCIENTIFIC AND ENGINEERING REVENUE DISTRIBUTION
BY MAJOR PROCESSING SERVICES VENDORS**

VENDOR	PRO-CES-SING SERVICES 1979	SCIEN-TIFC AND ENGI-NEERING	RCS 1979	INTER-ACTIVE	REMOTE BATCH
CDC	350	90	285	220	65
GEISCO	190	19	190	90	90
TYMSHARE	149	10	102	59	43
McAUTO	105	15	55	28	27
CSC	90	2	84	21	55
NCSS	84	16	63	26	37
UIS	82	50	82	62	20
BCS	62	18	44	9	35
MAJOR VENDOR SUBTOTAL	1,112	220	905	515	372
PERCENT TOTAL INDUSTRY	15%	65%	26%	26%	26%
TOTAL INDUSTRY	7,240	340	3,530	2,010	1,450

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BOEING COMPUTER SERVICES

- REVENUES*: 12/31/79
 - CAPTIVE \$400,000,000
 - NON-CAPTIVE \$93,000,000
- PROCESSING SERVICES
 - 97% RCS
 - 24% SCIENTIFIC AND ENGINEERING
- SCIENTIFIC AND ENGINEERING PRODUCT LINE
 - MAINSTREAM - EKS (ENHANCED KRONOS SYSTEM)
 - . CDC CYBER 175, 750, 760, CRAY 1
 - STRUCTURAL/STRESS ANALYSIS

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BCS NETWORK PROFILE

APPLICATION AREA/PRODUCT NAME

- OPERATING ENVIRONMENT
 - MAINSTREAM-CTS, IBM 370
 - MAINSTREAM-EKS, CDC CYBER 175, 750, 760
 - MAINSTREAM-TSO, IBM 3033
- PROGRAMMING LANGUAGES SUPPORTED
 - ALGOL
 - APL
 - ASSEMBLER
 - BASIC
 - COBOL
 - FORTAN
 - PL/1
 - PASCAL
 - SNOBOL 4
 - SIMSCRIPT 11.5
 - WAT FIV
- DATA MANAGEMENT SOFTWARE
 - DMS-170
 - EASY TRIEVE
 - GIS/2
 - IDMS
 - INQUIRE
 - MARK IV
 - SYSTEM 2000
- DATA BASES AVAILABLE
 - CITIBASE
 - EIS ECONOMIC DATA
- INDUSTRY SPECIFIC
 - SUPERACT (INSURANCE)
 - COMPLETE LINE OF BANKING APPLICATIONS
 - COMPLETE LINE OF THRIFT APPLICATIONS
- FINANCIAL APPLICATIONS/TOOLS
 - EXECUTIVE INFORMATION SYSTEM (EIS)
 - CASH CONTROL
 - CURRENCY CONVERSION
 - PLANNING SYSTEM GENERATOR (PSG)
 - FINANCIAL PLANNING (FPS)
 - BUSINESS ANALYSIS (BA/BASIC)
 - PAUS

APPLICATION AREA/PRODUCT NAME

- PROJECT MANAGEMENT
 - PROJECT 2
 - PMS IV
 - PROJACS
 - APEX III
 - MPSX
 - MINIPERT
 - CPM
 - ICES PROJECT 1
- STATISTICAL
 - STATISTICAL ANALYSIS (SAS, BMDP, STATPACK2, STATPK)
 - SCSS (CONVERSATIONAL SPSS)
 - SCIENTIFIC INFORMATION RETRIEVAL (SIR)
 - SPSS
 - STAT/BASIC
- STRUCTURAL/STRESS ANALYSIS
 - ANSYS
 - ESAP
 - GT STRUDAL
 - NASTRAN
 - TPIPE
 - MARC
 - SAP IV
 - STAGS
 - TRUS
 - E3 SAP
 - STARDYNE
- SCIENTIFIC AND ENGINEERING
 - SAIR II
 - HEC/HEC 2
 - BLAST
 - WREM
 - PDQ7
 - COGO
 - HYDRA
 - BANDIT
 - MITAS
 - TRACE
 - SCOUT
 - RELAP4
 - MORSE
 - CORNAP
 - SURVEY
- GRAPHICS/PLOTTING
 - BIGS
 - DISSPLA
 - TELL-A-GRAPH
 - INSTAPLOT
 - AGII
 - ZETALIB
 - CALCOMP
 - TEKTRONIX
 - HPLIB
 - GSILIB
 - SC4020
- OTHER
 - SCHOLAR/TEACH 3

CYBER SERVICES'
APPLICATIONS SOFTWARE PACKAGES:
BOEING COMPUTER SERVICES COMPANY

APPLICATION AREA

MAINSTREAM-EKS

- STRUCTURAL DESIGN SERVICES
 - GTSTRUDL
 - STARDYNE
 - MCS/NASTRAN
 - ANSYS
 - E³SAP
 - SYSPRO-SYSTEM PROFESSIONAL
 - MARC
 - SUPERTAB
- SPECIAL INDUSTRY PRODUCTS
 - BUILDING ENERGY
 - . SCOUT, BLAST, DOE, CAL/CON, TRACE, SOLCOST, F-CHART
 - NUCLEAR
 - . PDQ7
 - . TPIPE
 - CIVIL
 - . HEC-2, WATSIM, CAPDET
- SUPPORT PRODUCTS
 - MATHEMATICS/STATISTICS
 - . APEX III-PDS/MG
 - . NETG & IOPNET
 - . GPSS V & SIMSCRIPT 2.5
 - . SPSS
 - . SIR
 - PROJECT MANAGEMENT
 - . PROJECT/2
 - . PMS IV, PROJACS

CONTROL DATA CORPORATION

- DATA SERVICE REVENUES: 12/31/79
 - \$475,000,000
- PROCESSING SERVICES:
 - RCS (\$285 MILLION)
 - SCIENTIFIC AND ENGINEERING (\$90 MILLION)
- CYBERNET IS THE LARGEST VENDOR OF SCIENTIFIC AND ENGINEERING APPLICATIONS WITHIN THE RCS INDUSTRY.

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CDC PROFESSIONAL SERVICES

1979 REVENUES APPROXIMATELY \$50 MILLION

- AREAS OF EXPERTISE

- STRUCTURAL ENGINEERING
 - . CDC/NASTRAN
 - . SDRC MECHANICAL DESIGN LIBRARY
 - . GTICES STRUDL II
 - . UNISTRUC: INTERACTIVE GRAPHICS WITH INTERFACES TO OTHER STRUCTURED ENGINEERING PROGRAMS
 - . ANSYS
 - . ADPIPE

- PETROLEUM SERVICES

- INTERSYS IMAGE PROCESSING SOFTWARE
- 3-D SEISMIC PROCESSING: CYBER 200 FAMILY OF VECTOR COMPUTERS

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CDC PROFESSIONAL SERVICES (Cont.)

- NUCLEAR CONSULTING SERVICES
- ENERGY CONSULTING
 - ENERGY ANALYSIS PROGRAM
- MINING SERVICES

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CYBERNET
NETWORK PROFILE

APPLICATION AREA/PRODUCT NAME

- OPERATING ENVIRONMENT
 - CDC CYBER 170 AND 200/NOS, SCOPE
- PROGRAMMING LANGUAGES SUPPORTED
 - ALGOL, APL, BASIC, COBOL, COMPASS, FORTRAN, SIMULA, SIMSCRIPT
- DATA MANAGEMENT SOFTWARE
 - BASIS - SKILTEC
 - IFP - SYSTEM 2000
 - IS/ATHENA - TOTAL
 - LEXITEC - TOTAL/ATHENA
- DATA BASES AVAILABLE
 - CEDA - TECHNOTEC
 - EBIS
- MANAGEMENT SCIENCES
 - APEX III - PPS IV
 - DCO/TRANPLAN - PROPLAN
 - EZPERT - PROSE
 - GPSS V - SIMSCRIPT 11.5
 - IMSL - SIR
 - NETFLOW II - SORITEC
 - PDS/MaGen - SPSS
- FINANCIAL APPLICATIONS
 - ASCENT SYSTEM - SIBYL/RUNNER
 - IFPS
- CIVIL ENGINEERING
 - BARS - SPAM
 - CELS - SPSTRESS
 - DESCUS - STRU-PAK
 - FFAST - SURNAL
 - GTICES/STRU_DL - SYSTEMS PROFESSIONAL
 - POSTEN
- ELECTRONICS
 - ACSL - MICROLIB
 - ARRAYGEN - PREDICTOR
 - CC-TEGAS3 - RESULTS
 - CDC-SPICE2 - RFOPT
 - CSSL - SYSCAP II
- ENERGY CONSERVATION
 - BLAST - FCHART
 - CALERDA - .RSVP
 - ECUBE - SOLCOST
 - EP - TRNSYS
- GRAPHICS
 - DISSPLA - SACM
 - PERSPECTIVE - SURFACE-MAP
 - PLOTPAC - TIGS
 - PLOT-10 - UNIPLOT
- MACHINERY
 - CADENSE - SDRC/SUPERTAB
 - MITAS II - SINDA-9
 - SDRC/IMP - THERMAL
 - SDRC/MDL - TRASYS
 - SDRC/SUPERB

APPLICATION AREA/PRODUCT NAME

- NUCLEAR FUEL MANAGEMENT
 - ARMP - LEAHS
 - CITATION - PDQ7LEAHSV2
- OPTICAL SCIENCES
 - OPTICAL SCIENCE LIBRARY
- PETROLEUM AND MINING
 - GOLOG, GRAPH, - SSTRAN, MTRAN, HCOMP,
 - MULTI-LITH - TRANSFLOW, TLIQ, TCON
 - MINEVAL, MSCDES - STAMOR
 - SSI/100
- PIPING ANALYSIS
 - AAA-T - NUPIPE
 - ADLPIPE - PIPERUP, PRTHRUST
 - CAPIM - PIPESD
 - DIS - PIPLIN II
 - EZFLEX - WAVENET
 - HANGIT
- POWER SYSTEMS OPERATIONS AND DESIGN
 - COMMIT - PROCOS II
 - HEAT RATE CURVE - SYNFE
 - MEVAL - SYNTHA II
- POWER SYSTEMS PLANNING
 - EMTRAN - SSR
 - POWER FLOW - STABILITY
 - SCAN
- RADIATION SHIELDING AND CRITICALITY
 - AMPX - KENO-IV
 - ANISN - MORSE-CG
 - DOT 3.5 - SPAN-4
 - DOT IV
- REACTOR OPERATIONS SUPPORT
 - NIPS - PREM
- REACTOR SAFETY ANALYSIS
 - COBRA IV - HYDROMIX
 - CONTEMPT-LT - PISCES
 - DYNODE-2 - RELAP4/REPIPE
 - FLUSH - WREM
 - GALE
- STRUCTURAL ANALYSIS
 - ADINA - MARC-CDC
 - ANSYS - SACS
 - ARGUS - SAMBAS
 - CDC/NASTRAN - STARDYNE
 - EAC/EASE2 - UNISTRUC
- TELECOMMUNICATIONS
 - CDCSAVE - NPIA
 - CNET - PWAC
 - COMNET - TELTAPS

McDONNELL DOUGLAS AUTOMATION

REVENUE: 12/31/79

- CAPTIVE \$355,408,061
- NON-CAPTIVE \$125,000,000

PROCESSING SERVICES: \$105,000,000

- 15% SCIENTIFIC AND ENGINEERING

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McAUTO'S DISTRIBUTION OF SCIENTIFIC AND
ENGINEERING REVENUES

● STRUCTURAL ENGINEERING	40%
● PROJECT MANAGEMENT	20
● CHEMICAL ENGINEERING	15
● CIVIL ENGINEERING	10
● ELECTRONIC/ELECTRICAL	10
● OTHER	5
TOTAL	100%

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KEY APPLICATIONS AVAILABLE ON MCAUTO'S 370 AND CYBER SERVICE

APPLICATION AREA/PRODUCT NAME	APPLICATION AREA/PRODUCT NAME
<ul style="list-style-type: none"> • OPERATING ENVIRONMENT <ul style="list-style-type: none"> - CDC CYBER 74 AND 175, NOS - IBM 3032, 3033, 370/148, 158, 168, OS/MVS • PROGRAMMING LANGUAGES SUPPORTED <ul style="list-style-type: none"> - APL - FORTRAN - ASSEMBLY - PL/1 - BASIC - SIMSCRIPT - COBOL • DATA MANAGEMENT SOFTWARE <ul style="list-style-type: none"> - IMS - SYSTEM 2000 - CONFIRM • BUSINESS AND FINANCE <ul style="list-style-type: none"> - AUTOCOUNTANT (ACCOUNTS PAYABLE, RECEIVABLE, FIXED ASSETS, GENERAL LEDGER, PAYROLL, PERSONNEL) - FINANCIAL PLANNING (AUTOPLAN) - SHAREHOLDER RECORDS - STOCK TRANSFER (ASTS) - DIVIDEND REINVESTMENT (DRS) - CHECK RECONCILIATION • HOSPITAL COMMUNICATION AND INFORMATION SYSTEM <ul style="list-style-type: none"> - PATIENT CARE (HPC) - DATA COLLECTION (HDC) - FINANCIAL CONTROL (HFC) • MANUFACTURING/DISTRIBUTION <ul style="list-style-type: none"> - PROCESS PLANNING (CAPP) - CAPACITY PLANNING (CAPSOSS) - ON-LINE ORDER PROCESSING (CO-OP) - FREIGHT RATING AND ROUTING - VEHICLE SCHEDULING (IVES) - MATERIAL REQUIREMENTS PLANNING (MRP) - NUMERICAL CONTROL (COMPUDDRIVE) - MATERIAL MANAGEMENT (OMEGA) 	<ul style="list-style-type: none"> • OPERATIONS RESEARCH/STATISTICAL <ul style="list-style-type: none"> - BOX-JENKINS PROGRAMS - CONTINUOUS SYSTEMS MODELING - SIMULATION (GASP IV, GPSS VI) - NETWORK OPTIMIZATION (GNET) - STATISTICAL (SAS, STATPAK/TSO, UCLA BMD, COSAN, IBM SCIENTIFIC SUBROUTINES, IMSL LIBRARIES) • INSURANCE/HEALTH CARE <ul style="list-style-type: none"> - EMPLOYEE BENEFIT (EBS) - GROUP CLAIMS (GCPS) - MEDICARE B CLAIMS - PATIENT SERVICE RECORDS (PSRS) - MEDICAL RECORDS ABSTRACTING • EDUCATION <ul style="list-style-type: none"> - ON-LINE EDUCATIONAL SERVICE (AESOP) - ATTENDANCE - CENSUS REPORTING - FINANCIAL ACCOUNTING; PAYROLL - GRADE REPORTING - STUDENT SCHEDULING • SCIENCE AND ENGINEERING <ul style="list-style-type: none"> - CHEMICAL PROCESS ENGINEERING - CIVIL ENGINEERING - ELECTRIC POWER ENGINEERING - MATHEMATICS - ELECTRONICS ENGINEERING - NUCLEAR ENGINEERING - STRUCTURAL ENGINEERING - MCAUTO OFFSHORE PROGRAMS - NISEE EARTHQUAKE PROGRAMS - MECHANICAL ENGINEERING (BUILDING, DUCT DESIGN, HEAT TRANSFER, PIPING AND VESSELS) • OTHER <ul style="list-style-type: none"> - TELEPHONE INDUSTRY APPLICATIONS - GRAPHICS (VIVADATA, FASTDRAW) - TEXT EDITING (DATA DIALOG) - PROJECT MANAGEMENT - PROGRAM AIDS - COMPUTER OUTPUT MICROFILM

CYBER SERVICES¹
APPLICATIONS SOFTWARE PACKAGES:
McDONNELL DOUGLAS AUTOMATION COMPANY

- STRUCTURAL ENGINEERING
 - MARC [MARC ANALYSIS RESEARCH]
 - NASTRAN [MacNEAL SWANDLER]
 - NISA [ENGINEERING MECHANICS RESEARCH]
 - NONSAP
 - SAP
- CIVIL ENGINEERING
 - U.S. ARMY CORPS OF ENGINEERS PROGRAMS
- MECHANICAL ENGINEERING
 - ASHRAE/IES STANDARD FOR LIGHTING ENERGY (AISLE) [DOVERMAN ASSOCIATES]
 - BLESS [DOVERMAN ASSOCIATES]
- ELECTRONICS ENGINEERING
 - NET 2 ELECTRONIC CIRCUIT NETWORK ANALYSIS PROGRAM
 - SPICE
- CIVIL ENGINEERING
 - COGO
- NUCLEAR ENGINEERING
 - KRONIC
 - ORIGEN
 - SUBDOSA
 - TRUMP
- NISEE EARTHQUAKE PROGRAMS
 - LAYER
 - PSQGN
- PROGRAM AIDS
 - CALCOMP ROUTINES - PET
 - EDITMODE - SORT /MERGE
 - INTERMEDIATE PLOT FILE
 - INTERMEDIATE PLOT FILE POST PROCESSORS
 - MIAMAC
 - MIMDAC
 - MODIFY

CYBER SERVICES'
APPLICATIONS SOFTWARE PACKAGES:
McDONNELL DOUGLAS AUTOMATION COMPANY

- SCIENCE AND ENGINEERING/SPECIAL PURPOSE
 - DAC-II APPLICATIONS LIBRARY
 - SIMSCRIPT
- PIPING AND VESSELS
 - PIPEFLEX
 - TRIFLEX [AAA TECHNOLOGY]
 - TRIVESSEL [AAA TECHNOLOGY]
 - WERCO [AAA TECHNOLOGY]
- MANUFACTURING/DISTRIBUTION
 - INTERACTIVE VEHICLE SCHEDULING (IVESS)
- STATISTICAL ANALYSIS
 - ANSYS
 - BOSOR
 - CONVERSATIONAL STATISTICAL ANALYSIS (COSAN)
 - IMSL LIBRARIES [INTERNATIONAL MATHEMATICAL AND STATISTICAL LIBRARIES]
 - UCLA BIOMEDICAL COMPUTER PROGRAMS
- OPERATIONS RESEARCH
 - LINPRO
 - STATPAK/TSO
- MATHEMATICS
 - MATHLIB
 - EISPACK (RELEASE 2) [ARGONNE NATIONAL LABORATORY]
- PROJECT MANAGEMENT
 - LEEWAY
- BUSINESS AND FINANCE
 - ANNUIT
 - CONFIRM
 - QUESTIONNAIRE ANALYSTS

UNITED INFORMATION SYSTEMS GROUP

REVENUE: 12/31/79

- \$138,446,000

PROCESSING SERVICES: \$92,758,820

- 99% RCS
 - 76% INTERACTIVE
 - 24% REMOTE BATCH
- 60% SCIENTIFIC AND ENGINEERING

INPUT

UNITED INFORMATION SYSTEMS GROUP

- STRUCTURAL ANALYSIS
- PIPE ANALYSIS
- CHEMSHARE (DESIGN AND SIMULATION OF REFINERIES)
- ECUBE (ENERGY ANALYSIS FROM AMERICAN GAS ASSOCIATION)
- POGOS (POWER GENERATION AND OPTIMIZATION SYSTEM)
- MAPPING (PROGRAM FOR THREE-DIMENSIONAL SURFACES)

INPUT

UNITED INFORMATION SYSTEMS GROUP: (Cont.)

SCIENTIFIC AND ENGINEERING PRODUCT LINE:

- NETWORK INFORMATION SERVICES DIVISION
 - APEX OPERATING SYSTEM
 - . 3 CDC 6600
 - . 4 CDC CYBER 170
 - . 2 CDC 3300
 - CRAY OPERATING SYSTEM
 - . 1 CRAY-I
- UTILITY DATA MANAGEMENT SERVICES DIVISION
 - CDC CYBER 176
 - UNIVAC 1100

INPUT

UIS - NIS DIVISION
NETWORK PROFILE

APPLICATION AREA/PRODUCT NAME	APPLICATION AREA/PRODUCT NAME
<ul style="list-style-type: none"> • OPERATING ENVIRONMENT <ul style="list-style-type: none"> - CDC CYBER 170, 6600 (APEX/SCOPE) - CRAY-1 (COS) • PROGRAMMING LANGUAGE SUPPORTED <ul style="list-style-type: none"> - APL - BASIC - COBOL - COMPASS - FORTRAN - PASCAL - SUPER BASIC - SUPER FORTRAN • DATA MANAGEMENT SOFTWARE <ul style="list-style-type: none"> - INTERACTIVE FILE MANAGER (IFM) - INFORM - SEED - SYSTEM 2000 - TOTAL • GRAPHICS <ul style="list-style-type: none"> - UNIGRAPH - DISSPLA - CALMAGRAPHIC INTERACTIVE (CGI) • PROJECT MANAGEMENT <ul style="list-style-type: none"> - TOPMAN (TRACKING) - LESTIME AND TIMETABLE (CPM) • FINANCIAL APPLICATIONS/TOOLS <ul style="list-style-type: none"> - MANAGE (PORTFOLIO MANAGEMENT) - FORESIGHT (FINANCIAL ANALYSIS) • DATA BASES <ul style="list-style-type: none"> - CENSUS - COMPUTSTAT - TELSTAT (SECURITY PRICING) - INSIGHT (ECONOMETRIC DATA) 	<ul style="list-style-type: none"> • STRUCTURAL ANALYSIS <ul style="list-style-type: none"> - ANSYS - NASTRAN - GIFTS - SPACE 4 - MARC • MATHEMATICAL/STATISTICAL <ul style="list-style-type: none"> - IMSL LIBRARY - SPSS - PROSE (CALCULUS LANGUAGE) - ALPS (LINEAR PROGRAMMING) - UNISTAT • KEY SCIENTIFIC AND ENGINEERING PRODUCTS <ul style="list-style-type: none"> - COMPACT (CIRCUIT DESIGN) - PIPING ANALYSIS (AUTOFLEX, DYNAFLEX, TRIFLEX, ADLPIPE) - SACM (MAPPING) - CHEMSHARE (REFINERY SIMULATION) - ECUBE (ENERGY ANALYSIS) - POGOS (POWER PLANT SIMULATION) • ENGINEERING (NUMEROUS PROGRAMS) <ul style="list-style-type: none"> - CIVIL - MECHANICAL - ELECTRICAL - CHEMICAL - PETROLEUM - ENERGY - COMMUNICATIONS - MARINE - NUMERICAL CONTROL • TELEPHONE ENGINEERING <ul style="list-style-type: none"> - AIMS - DACCS - DIMS - FACT - MORE - VUSET

UNIVERSITY COMPUTING CORPORATION

REVENUE: 12/31/79

- \$87,100,000

U.S. PROCESSING SERVICES: \$22,000,000

- 100% RCS
- 68% SCIENTIFIC AND ENGINEERING

INPUT

UCC
U.S. NETWORK APPLICATION PROFILE

APPLICATION AREA/PRODUCT NAME	APPLICATION AREA/PRODUCT NAME
<ul style="list-style-type: none">• OPERATING ENVIRONMENT<ul style="list-style-type: none">– UNIVAC 1108, 1100/81– CDC CYBER 175, CYBER 170/750– IBM 370/168• PROGRAMMING LANGUAGES SUPPORTED<ul style="list-style-type: none">– FORTRAN– COBOL• DATA MANAGEMENT SOFTWARE<ul style="list-style-type: none">– db IV (UCC DBMS)• CHEMICAL ENGINEERING<ul style="list-style-type: none">– IRIS PDSMS• STRUCTURAL ENGINEERING<ul style="list-style-type: none">– ANSYS, NASTRAN/COSMIC, NASTRAN/MAC NEAL-SCHWENDLER, PCA, SACM, SAP 4-6, SPESI-5, SPACE IV, STRESS II, STRUDL-II, TRI DRILL, EASE2• MARINE ENGINEERING<ul style="list-style-type: none">– MRI/MARRS, SACS II, SHIP HULL CHARACTERISTICS• PIPING ANALYSIS<ul style="list-style-type: none">– ADPIPE, AUTOFLEX, DYNAFLEX, EZFLEX, FLANGE DESIGN, TRIFLEX, WERCO• HEAT TRANSFER<ul style="list-style-type: none">– AC-2, AIDEX, FRNC-5, HTRI, SINDA• PROCESS ENGINEERING<ul style="list-style-type: none">– AMOCO, CHEMSHARE, NGPA, SSI/100, SSI/DR 01	<ul style="list-style-type: none">• ARCHITECTURAL ENGINEERING<ul style="list-style-type: none">– BUILDING ENERGY (EEC, ERCK, ERE, TCR), 110-ICES, LUMEN-2, MEDSI• ELECTRONICS<ul style="list-style-type: none">– D-LASER, MAGIC, MICROPROCESSOR, RM PREDICTOR, SCEPTRE, SPICE, UCCAP, MONOCHIP• NUMERICAL CONTROL<ul style="list-style-type: none">– UCC APT• LINEAR PROGRAMMING<ul style="list-style-type: none">– FMPS, GAMMA 3.0 AND 3.4• MATH/STATISTICS<ul style="list-style-type: none">– BMD SERIES, IMSL, MATH-PACK, STAT-PACK• SIMULATION<ul style="list-style-type: none">– GPSSV, GPSS/UCC, MIMIC, SIMSCRIPT.• NUCLEAR (MAJOR CATEGORIES)<ul style="list-style-type: none">– TRANSIENTS AND THERMAL HYDRAULICS– LICENSING AND SAFETY ANALYSIS– CONTAINMENT ANALYSIS– SHIELDING ANALYSIS– CROSS-SECTION DATA SET– IN-CORE MANAGEMENT• OTHER<ul style="list-style-type: none">– WORD PROCESSING (FASTEXT AND UTYPY)– FASBAC APPLICATIONS LIBRARY– PROJECT MANAGEMENT (N 5500, PROJECT/2)– VESSEL DESIGN (VESSEL AND WERCO)

CYBER SERVICES[®]
APPLICATIONS SOFTWARE PACKAGES:
UNIVERSITY COMPUTING COMPANY

APPLICATION AREA

- CHEMICAL ENGINEERING
 - IRIS, PDSMS
- STRUCTURAL ENGINEERING
 - ANSYS, NASTRAN/COSMIC, NASTRAN/MAC NEAL-SCHWENDLER, PCA, SACM, SAP 4-6, SEPSI-5, SPACE IV, STRESS II, STRUDL-II, TRI DRILL
- MARINE ENGINEERING
 - MRI/MARRS, SACS II, SHIP HULL CHARACTERISTICS
- PIPING ANALYSIS
 - ADPIPE, AUTOFLEX, DYNAFLEX, EZFLEX, FLANGE DESIGN, TRIFLEX, WERCO
- HEAT TRANSFER
 - AC-2, AIDEX, FRNC-5, HTRI, SINDA
- PROCESS ENGINEERING
 - AMOCO, CHEMSHARE, NGPA, SSI/100, SSI/DR 01
- ARCHITECTURAL ENGINEERING
 - BUILDING ENERGY (EEC, ERCK, ERE, TCR), 1100-ICES, LUMEN-2, MEDSI
- NUMERICAL CONTROL
 - UCC APT
- LINEAR PROGRAMMING
 - FMPS, GAMMA 3.0 AND 3.4
- MATH/STATISTICS
 - BMD SERIES, IMSL, MATH-PACK, STAT-PACK
- SIMULATION
 - GPSSV, GPSS/UCC, MIMIC, SIMSCRIPT

COMPETITION

- USERS ARE MORE CONCERNED WITH PERFORMANCE THAN PRICE
- CDC REGARDED AS PRIME COMPETITOR, FOLLOWED BY:
 - UIS
 - UCC
 - BCS
 - SIS

INPUT

HOW THE CYBER VENDORS RANK
COMPETITIVELY, AS REPORTED
BY VENDOR RESPONDENTS

VENDOR	RANK
CONTROL DATA CORPORATION	1
UNITED INFORMATION SYSTEMS	2
UNIVERSITY COMPUTING CORPORATION	3
BOEING COMPUTER SERVICES	4
McDONNELL DOUGLAS AUTOMATION COMPANY	5
SUN INFORMATION SERVICES	6

REMOTE COMPUTING SERVICES
STRATEGIES AND TACTICS
RELATED TO SCIENTIFIC
AND ENGINEERING MARKETS

INPUT

MOST IMPORTANT SCIENTIFIC AND ENGINEERING
APPLICATION GROUP

- STRUCTURAL ANALYSIS
 - ANSYS: ANALYSIS SYSTEM
 - NASTRAN: NASA STRUCTURAL ANALYSIS
 - . COSMIC
 - . MACNEIL-SCHWENDLER
 - . CDC
- STRUDL: STRUCTURAL DESIGN LANGUAGE
 - . ICES: INTEGRATED CIVIL ENGINEERING SYSTEMS

INPUT

**MOST IMPORTANT SCIENTIFIC AND ENGINEERING
APPLICATION GROUP (CONT.)**

- **PIPING ANALYSIS**
 - TRIFLEX
 - AUTOFLEX
 - ADPIPE
 - DYNAFLEX
- **ELECTRONICS**
 - SPICE
 - MICRO PROCESSOR

INPUT

**SCIENTIFIC AND ENGINEERING APPLICATION
GROUPS SUPPORT PRODUCTS**

- PROGRAMMING LANGUAGES
 - FORTRAN
 - APL
- MATHEMATICS/STATISTICS
 - MPSX
 - GPSS
- PROJECT MANAGEMENT
 - PMS IV
 - PROJECT 2
 - APEX III
- GRAPHICS
 - DISSPLA
 - TEKTRONIX
 - CALCOMP

INPUT

SOURCES OF SCIENTIFIC AND ENGINEERING
SOFTWARE PRODUCTS

SOURCE	PERCENT
• RCS VENDOR	35%
• THIRD-PARTY SOFTWARE DEVELOPERS	50
• UNIVERSITIES	5
• CONTROL DATA CORPORATION	5
• CUSTOMER SUPPLIED	5
TOTAL	100%

INPUT

UCS
PROGRAMS DEVELOPED BY
INDEPENDENT OWNERS

Developer	Program Name
A Technology 6 Skyline Dr., Suite 200 Houston, Texas 77027	TRIN TRIFLEX WERCO TRIVESL TRIDRIL
uratech, Inc. 2 Chevy Chase Dr. ouston, Texas 77027	LESTIME TIMETABLE (PLANNER)
D., Inc. Box 45773 a, Okla. 74145	AIDEX
merican Gas Assoc. 5 Wilson Blvd. ington, VA 22209	ECUBE
lications Consultants, Inc. 5 West Loop, Suite 408 aire, Tex. 77401	SACM SACMPRE
lied Management Methods Jacksonville Road e 100 minster, Pa. 18974	TOPMAN
on Computing Corp. Columbus Circle York, N.Y. 10019	AUTOFLX DYNAFLX
Bradshaw, Inc. Central Building entral Street ham, MA 02154	WAVNET
C.I., Inc.—Federal o N. Fort Meyer Dr. ington, VA 22209	SITE DEMOGRAPHICS SYSTEMS

UCS

Developer	Program Name
General Telephone & Electronics Data Services, Inc. P.O. Box 1548 Tampa, Fla. 33601	GTEDS PROGRAMS
Heat Transfer Research, Inc. 1000 South Fremont Ave. Alhambra, Calif. 91803	HTRCST1 HTRIOPG HTRIST4 HTRRKH1 HTRRTF2
The Hydrologic Engineering Center Corps of Engineers, U.S. Army 609 Second Street Davis, Calif. 95616	HEC1 HEC2 HEC3 HEC4 HEC1DB HECFFF
Integrated Software Systems Corporation 1186 Sorrento Valley Blvd. Suite N San Diego, Calif. 92121	DISSPLA DISSPOP
International Mathematical & Statistical Libraries, Inc. Sixth Floor, GNB Building 1500 Bellaire Houston, Texas 77036	IMSL SUBROUTINES
Dr. Hussein A. Kamel University of Arizona Aerospace and Mechanical Engineering Tucson, Arizona 85721	GIFTS
Kranzley and Co. 1010 S. King's Highway Cherry Hill, N.J. 08034	PLANET
McGraw-Hill Book Co. 221 Avenue of the Americas New York, N.Y. 10020	CARRIER REEP ROARK
Mechanical Engineering Data Services, Inc. 10 Kimler Dr. Maryland Heights, Mo. 63043	MEDSI

UCS

Developer	Program Name
California Computer Products 2411 West LaPalma Avenue Anaheim, California 94303	FLOWGEN
ChemShare Corp. 2700 S. Post Oak Suite 2500 Houston, Texas 77017	DESIGN DISTILL REFINE
Cincom Systems, Inc. 2300 Montana Ave. Cincinnati, Ohio 45211	TOTAL
Commodity Information Services Co. 33 W. Ridge Pike Limerick, Pa. 19468	CISCO PROGRAMS
Compact Engineering, Inc. 1088 Valley View Ct. Los Altos, Calif. 94022	DEELAY COMPACT FILSYN AMPSYN
COMPUCON, Inc. 13740 Neutron Rd. Dallas, Texas 75240	SCORE PROGRAMS RISK FINANCE
Data Resources, Inc. 29 Hartwell Ave. Lexington, Mass. 02173	INSIGHT
Digital Analysis Consultants, Inc. 7460 Girard Ave. La Jolla, Calif. 92037	SPACE4
Essay Corp. Fifth Floor, 100 Park Ave. Oklahoma City, Okla. 73102	APTO LSF
Fire Sprinkler Consultants 501 Sunshine Rd. Kansas City, KS 66115	FIRE SPRINKLER DESIGN PROGRAMS
Garrett Computing Systems 1111 Republic National Bank Tower Dallas, Texas 75201	GARRETT COMPUTING PROGRAMS

UCS

Developer

Simulation Sciences, Inc.
1400 North Harbor Blvd.
Fullerton, Calif. 92635

Standard Oil of Ohio
623 Republic Building
Cleveland, Ohio 44115

Stanford Research Institute
333 Ravens Wood Ave.
Menlo Park, Calif. 94025

STS, Inc.
11 South Meramec, Suite 1304
St. Louis, Mo. 63105
ACCUFOR is a trademark of STS, Inc.

Swanson Analysis Systems, Inc.
870 Pine View Drive
Elizabeth, Penn. 15037

Synercom Technology, Inc.
6300 Hillcroft, Suite 303
Houston, Texas 77036

Systems Professional
2042 Broadway
Santa Monica, CA 90034

Tektronix, Inc.
Information Display Group
P.O. Box 500
Beaverton, Ore. 97077

Unitech, Inc.
1005 E. St. Elmo Road
Austin, Texas 78745

Universal Analytics, Inc.
7740 W. Manchester Blvd.
Playa Del Rey, Calif. 90291

Universal Software Application
13001 Cannes Drive
St. Louis, Mo. 63141

Program Name

SSI/100
SSIVLE
PROCES

FORTELL

TSP

ACCUFOR
ACUFORX

ANSYS
ANSPOST

MARCS
STRAN

SYSTEMS
PROFESSIONAL
PROGRAMS
SPSTRES

TEKTRONIX

CPS1

NASTRAN

EARTH
EARTH
FLOOR
FLOOR

UCS

Developer

University of California
Earthquake Engineering Research Center
Berkeley, Calif. 94720

V & S Engineering Co.
10927 Sagwade Lane
Houston, Texas 77089

Vogelback Computing Center
Northwestern University
2129 Sheridan Road
Evanston, Ill. 60201

Warner & Swasey Co.
5701 Carnegie Ave.
Cleveland, Ohio 44103

Robert M. Williams
1620 West Thomas Road
Phoenix, Arizona 85015

Program Name

SSAP
NONSAP
COMBINE
FLUSH

EZFLEX

SPSS
SPSSONL

CUTSII

SECS

VENDOR DIFFERENTIATIONS

- MAINFRAME
 - CDC
 - IBM
 - UNIVAC
- PRODUCT ENHANCEMENTS
 - "LATEST" VERSION
- USER SUPPORT PRODUCTS INTERFACE
 - EASE OF USE
 - PRODUCT DOCUMENTATION
- STANDARD REPORTS
 - CUSTOM REPORTS
- CUSTOMER SERVICE
 - SUPPORT
 - TRAINING
 - DOCUMENTATION

INPUT

CYBER CENTER

- CDC CYBER 170-750 FRONT END
- BACKUP MACHINE
 - ANOTHER CDC CYBER
 - CRAY
- DOMINANT FEATURES
 - EXTENDED CORE STORAGE
 - ARRAY OR MATRIX PROCESSING
- DEDICATED TRANSMISSION NETWORK vs. PUBLIC NETWORK
 - BETTER RELIABILITY
 - SELF-CHECKING FEATURES
 - HANDLES 80% OF DATA TRANSMITTED
- MODE OF DELIVERY
 - 50% REMOTE BATCH
 - 50% INTERACTIVE

INPUT

PRICING METHODS

- RESOURCE PRICING: TRADITIONAL RCS METHOD (88%)
 - CONNECT
 - . HIGH SPEED
 - . LOW SPEED
 - CPU
 - . I/O
 - STORAGE
 - . ON LINE
 - . OFF LINE
 - PERIPHERALS
 - . HIGH-SPEED PRINTERS
 - . TAPE DRIVES
 - . PLOTTERS

INPUT

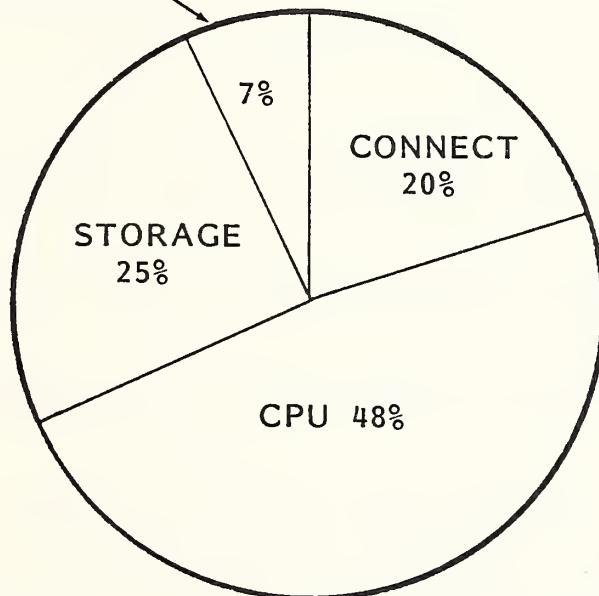
PRICING METHODS (CONT.)

- TRANSACTION PRICING (8%)
 - USER-ORIENTED MEASUREMENTS
 - . NUMBER OF ACCOUNTS
 - . NUMBER OF UNIT TRANSACTIONS
 - NORMALLY USED FOR SOFTWARE PACKAGES
- FIXED PRICE (3%)
 - FIXED DOLLAR AMOUNT
 - . PER TERMINAL
 - . DEDICATED SYSTEM

INPUT

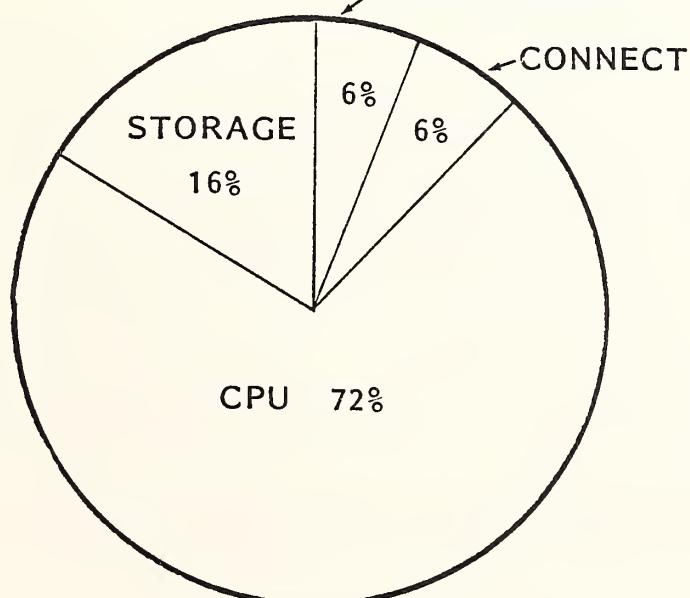
RCS RESOURCE PRICING BY MODE OF DELIVERY

PERIPHERALS



INTERACTIVE

PERIPHERALS



REMOTE BATCH

INPUT

CYBER SERVICES PRICING

- USAGE BASIS BASED ON PRICING ALGORITHM
- ALGORITHM BASED UPON REASONABLE ROI
- SOME VENDORS HAVE A MINIMUM CHARGE
- UNIT PRICING WHICH IS INDEPENDENT OF RESOURCES USED IS BASED UPON EACH UNIT OF OUTPUT
 - NUMBER OF ELBOWS, EXTENSIONS IN A PIPING SYSTEM.
- DISCOUNTING
 - VENDORS DO NOT DISCOUNT INDIVIDUAL CUSTOMERS
 - DISCOUNTS PROVIDED FOR NON-PRIME TIME USAGE VIA LOWER STANDARD RATES
 - . 50% SECOND SHIFT
 - . 70% OVERNIGHT BATCH
- SLIDING PRICE BASED UPON VOLUME OF USAGE

INPUT

**Control Data CYBERNET[®] Services:
NOS Computing Service
Price Schedule**



1. COMPUTER SYSTEM USAGE		NOS		NOS 175		NOS 176	
		PRIORITY	PRICE	PRIORITY	PRICE	PRIORITY	PRICE
Charge per System Billing Unit (SBU)		Interactive	\$0.38	Interactive	\$0.38	Interactive	\$0.38
		P4 Standard	\$0.38	P6 Express	\$0.30	P6 Express	\$0.30
		P2 Nonprime	\$0.22	P4 Standard	\$0.24	P4 Standard	\$0.24
				P3 Deferred.....	\$0.20	P3 Deferred.....	\$0.20
				P2 Nonprime	\$0.15	P2 Nonprime	\$0.15
				P1 Weekend	\$0.11	P1 Weekend	\$0.11
2. ON-LINE STORAGE							
Charge per Storage Data Block (SDB) per day							\$0.016
Charge per Extended Data Block (XDB) per day							\$3.00
Volume Data Pak per month							
50M Pak.....							\$4500
100M Pak							\$8000
Volume discount on total NOS monthly storage charges:							
\$0-\$400							No discount
\$400-\$1800							18% on amount over \$400
\$1800-\$7200							\$252 plus 40% on amount over \$1800
Over \$7200							\$2412 plus 50% on amount over \$7200
3. ACCESS FROM CYBERNET SERVICE CENTERS							
Charge per Input-Output Data Block (IODB) for work submitted at CYBERNET Service Centers							\$0.03
4. PRIVATE TERMINAL CONNECTION							
Charge per connect hour:							
Interactive Terminals							
Standard:							
10, 14.8, 30 cps Local Dial-up							\$9.00 plus \$0.25 per 1000 characters transferred to or from the terminal
30 cps INWATS							\$21.00 plus \$0.25 per 1000 characters transferred to or from the terminal
120 cps Local Dial-up							\$15.00 plus \$0.10 per 1000 characters transferred to or from the terminal
120 cps INWATS							\$27.00 plus \$0.10 per 1000 characters transferred to or from the terminal
Customer Option:							
10 cps Local Dial-up							\$12.00
14.8 cps Local Dial-up.....							\$15.00
30 cps Local Dial-up							\$17.50
30 cps INWATS.....							\$29.50
120 cps Local Dial-up							\$28.00
120 cps INWATS.....							\$40.00
Batch Terminals							
4800 bps shared access port							
NOS							\$18.00 plus \$0.03 per 1280 characters transferred to or from the terminal
NOS 175 and NOS 176							\$18.00
5. CDC CYBERLINK							
Charge per Data Block (DB) transferred between services (i.e., SCOPE 3.4, NOS 176, NOS, NOS 175, CYBER 76, Graphics)							\$0.02

MAGNETIC TAPE USAGE				
CYBERNET tape reel storage	\$0.20 per day			
Customer tape reel storage	\$0.10 per day			
Tape processing	\$2.00 per tape reel mounted plus an additional \$30.00 per hour if tape assigned for interactive processing			
MINIMUM CHARGE\$100 per month per Client Number				
MISCELLANEOUS SERVICES				
OFF-LINE I/O PROCESSING SYSTEM USAGE				
	<i>Hourly Rate by Turnaround Service Level</i>			
System	2 Hours	24 Hours		
160A/8090	\$99	\$55		
PRINTER OUTPUT CHARGES				
Off-line printing	\$0.06 per output page for one-part paper			
Multi-part paper charge	\$0.01 per page for each additional part plus \$10.00 set-up charge			
On-line printer forms charge	\$15.00 set-up charge			
OFF-LINE TELEPROCESSING \$99 per hour				
MACHINE READABLE ACCOUNTING USER DETAIL FILE \$25 per file				
5. WALK-IN USE OF SERVICE CENTERS				
Interactive Terminal (10-30 cps)	\$15.00 per hour			
Voice-grade Batch Terminal	\$75.00 per hour.			
6. OTHER SERVICES				
	Refer to local CYBERNET Service Center for prices:			
	<ul style="list-style-type: none"> • File utility service • Clerical • 10-inch and 30-inch plotting • Keypunching and verifying • Tape cleaning and certification 			
	Additional expenses incurred by CYBERNET Services at Customer's request are to be paid by the Customer.			
VOLUME USAGE DISCOUNT				
Monthly Volume		Discount Amount		
\$0-\$5000	No discount			
\$5000-\$10,000	5% on amount over \$5000			
\$10,000-\$20,000	\$250 plus 10% on amount over \$10,000			
Over \$20,000	\$1250 plus 15% on amount over \$20,000			
Applies only to the following monthly charges:				
<ul style="list-style-type: none"> • System Billing Units • Unit record input and output • Off-line printer output • Shared access terminal connect time • Magnetic tape usage 				

DEFINITIONS

SYSTEM BILLING UNIT: A System Billing Unit is the pricing component which accounts for resources used (e.g. CPU, memory, I/O) during execution of a Customer's job.

SERVICE LEVELS: The level of service obtained is determined by the job priority specified by the Customer. Higher priority jobs will process at a faster rate than lower priority jobs.

Service Level P6, P4 and P3 jobs are initiated during all periods of operation.

Service Level P2 jobs are initiated during Nonprime (after 7:00 p.m. local center time Monday through Friday and all day Saturday and Sunday).

Service Level P1 jobs are initiated Weekends (after 7:00 p.m. local center time Friday and all day Saturday and Sunday).

STANDARD DATA BLOCK: A Standard Data Block is used as the measure for all standard on-line storage and input/output volumes for processing on the CYBERNET System. A Standard Data Block is always 1280 six-bit characters in length, whether it is a Storage Data Block (SDB) or an Input/Output Data Block (IODB).

EXTENDED DATA BLOCK: An Extended Data Block (XDB) consists of 512,000 six-bit characters and is used as the measure for all Extended Direct Access on-line storage under NOS. Extended Direct Access files are initialized with two Extended Data Blocks.

VOLUME DATA PAK: A Volume Data Pak consists of 50 million six-bit characters for the 50M Pak or 100 million six-bit characters for the 100M Pak and is used as the fixed measure of on-line storage on a monthly package basis. SDB's used in excess of the Volume Data Pak will be charged at the standard charge for SDB's. The Volume Data Pak is provided only at the Customer's Charge Number level.

This Price Schedule of CYBERNET Service charges applies to all U.S. CYBERNET Centers operated by Control Data Corporation and is effective April 29, 1980, and it does not include any applicable Federal, State or local taxes. Control Data expressly reserves the right to change said prices upon thirty (30) days prior written notice.

CYBERNET Services reserves the right to bill the Customer for other charges that may be incurred in conjunction with the use of the services identified in this Price Schedule.

**UNITED COMPUTING SYSTEMS, INC.
UCS, INC.
CONTINENTAL U.S.A. APEX/SL & UCS/CRAY PRICE SCHEDULE**

INITIATION OF SERVICE

There is a \$100.00 initiation of service charge. This applies to customer's initial terminal(s) only for each continuous contract period.

APEX/SL TIMESHARING

Service Option	CONNECT CHARGES			PROCESSING CHARGES	
	Base Connect	Terminal Input/Output	120 CPS Surcharge	Service Unit	APL-Only Processing
A	\$ 9.50/hour	\$.18/Kch	\$10.00/hour	\$.31/SU-A	\$.15/SU-A
B	\$14.50/hour	\$.24/Kch	\$10.00/hour	\$.22/SU-B	\$.12/SU-B

Customers may elect either option. Written notice 30 days prior to the beginning of the month is required to change options. Terminal Input/Output is measured in Kilo characters (Kch), or thousands of characters transmitted to and from the terminal. The Kch charge for 120 cps usage is limited to a per hour rate of 210 Kch for Option A and 165 Kch for Option B.

APEX/SL REMOTE BATCH/REMOTE JOB ENTRY/LOCAL BATCH

Remote Batch Connect Rates (Dial-up)†	Processing Charges	Option 1	Option 2
2000/2400 Baud	Express Service (L25)*	\$.62/SU-1	.55/SU-2
3600 Baud	Standard Service Prime Time**38/SU-1	.32/SU-2
4800 Baud	Standard Service Non-Prime Time***35/SU-1	.29/SU-2
Batch Input/Output	Deferred Service (L10)****29/SU-1	.25/SU-2
	Delayed Service (L5)****25/SU-1	.21/SU-2

Customers may elect either option. Written notice 30 days prior to the beginning of the month is required to change options.

Remote Job Entry Connect Hour is the same as connect hour charges for Time-Sharing Option A and B.

IODB is a measure of the INPUT and OUTPUT file sizes at job execution.

† A surcharge of \$10.00/hour will apply for use of a UCS remote batch terminal. In addition, selected UCS field offices may offer service at the following speeds: 7200 Baud @ \$32.50/hour, 9600 Baud @ \$37.50/hour, 19,200 Baud @ \$50.00/hour, 40.8 KBaud @ \$60.00/hour, 50.8 KBaud @ \$67.50/hour, or 56 KBaud @ \$75.00/hour. Dedicated (unlimited-use) ports are offered on a limited availability basis for a fixed monthly fee plus dedicated line and modem charges. Fixed monthly fees:

4800 Baud @ \$3500/month 7200 Baud @ \$4500/month 9600 Baud @ \$5500/month

*Express Service Limitations:

6600 Processing - 256 CPU seconds, 80,000+ words of memory, 4096 Disk PRU's, and no magnetic tape operations.

175 Processing - 256 CPU seconds, 131,000+ words of memory, 20,480 Disk PRU's, and no magnetic tape operations.

**Prime-Time — 5:00 a.m. to 7:00 p.m. CT Monday through Friday.

***Non-Prime Time — 7:00 p.m. to 2:00 a.m. CT Weekdays and all weekend. Non-Prime Services carry a higher resource priority than Delayed or Deferred Service.

****Deferred/Delayed Service — available after 6:00 p.m./8:00 p.m. CT weekdays and all weekend. Jobs requesting Deferred/Delayed Services before 6:00 p.m./8:00 p.m. CT are queued into the system until the appropriate time (weekdays only).

Minimum Run Charge — \$ 2.00 per job, except when Central site Peripherals are used.
\$10.00 per job when Central Site Peripherals are used.

APEX/SL Service Unit Definition

The Time-Sharing and Batch Service Units (SU) are composite measurements of computer resources used during job processing. In each case the SU is comprised of an appropriate mixture of resources that include CPU time, memory, disk PRU's, disk accesses, tape PRU's, tape accesses, permanent file operations and, in some cases, proprietary software utilization.

APEX/SL ACCESS TIME		DEDICATED SYSTEM TIME (2 hr. min. when available)	
5:00 a.m. — 2:00 a.m.	Central Time Mon. - Fri.	CDC-6600	\$1200 per wall clock hour
6:00 a.m. — Midnight	Central Time Saturday	CYBER-174	\$1500 per wall clock hour
8:00 a.m. — 8:00 p.m.	Central Time Sunday	CYBER-175	\$3000 per wall clock hour

UCS/CRAY PROCESSING

PROCESSING CHARGES		JOB DISCOUNT	
Job Priority	Per Service Unit Charge	Total Job Service Units	Discount Percentage
L25 - Express	\$1.52	2.0 - 99.99	0%
L15 - Standard	\$.98	100.0 - 299.99	10%
L5 - Delayed*	\$.80	300.0 - 599.99	20%
Job Minimum = 2.0 Service Units		600.0 and Above	30%

*Delayed Service - available after 7:00 p.m. central time weekdays and all weekend. Jobs submitted before 7:00 p.m. requesting Delayed Services are not released for processing from the input queue until 7:00 p.m. (weekdays only).

UCS/CRAY Service Unit Definitions

The UCS/CRAY Service Unit (CSU) is a composite measurement of resources consumed during job processing. Included in the measurement are CP time, IO, memory and file activity factors.

The Applications Service Unit (ASU) is a composite measurement of UCS/CRAY Service Units and software utilization factors.

UCS/CRAY ACCESS TIMES

8:00 a.m. - Midnight	Central Time Mon. - Fri.
8:00 a.m. - Midnight	Central Time Saturday
8:00 a.m. - 8:00 p.m.	Sunday

UCS/CRAY DEDICATED SYSTEM TIME (when available)

UCS/CRAY	\$10,000 per wall clock hour
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STORAGE

Permanent System Storage

\$.39/month/unit of 1000 characters

Number of Units

	Discount
0 - 1,000	0%
1,000 - 5,000	10% on units in excess of 1,000 and less than 5,000
5,000 - 15,000	15% on units in excess of 5,000 and less than 15,000
15,000 - 50,000	25% on units in excess of 15,000 and less than 50,000
50,000 and over	50% on units in excess of 50,000.

Direct Access File Storage

\$55.00/month/unit of 204,800 characters

All storage charges are calculated to the nearest number of seconds the storage unit is saved. The storage discount applies only to 1,000 character units (Permanent System Storage only). There is a \$50.00 monthly permanent storage minimum per customer invoice.

CATALOG MAINTENANCE CHARGE

There is a \$1.00 per month maintenance charge for each customer user number assigned.

SPECIAL HANDLING CHARGES

A charge of \$12.50 per month will be made for those customers requiring special handling of monthly invoices. Other special reports quoted on request.

APPLICATIONS AND LANGUAGES

UCS customers shall have the right to usage of all programs and languages as described in the UCS Customer Publications free of charge, except for certain proprietary programs which carry a special services surcharge. Information on these is available upon request.

MONTHLY MINIMUM

There is a \$300.00 monthly minimum on computer service usage. This applies to the combined usage under all user numbers validated for a customer.

VOLUME USE DISCOUNT

Customer Usage (Monthly Billing)	Discount
Portion of APEX Billing over \$5,000	5%
Portion of CRAY Billing over \$5,000	5%

The Volume Use Discount shall apply to the customer's monthly usage of UCS Services, excluding manuals, terminals, consulting services and special service charges which may include royalties for the use of proprietary software. The factors shall apply to the customer's monthly usage as determined by the aggregate amount of UCS billing. Credits will be issued each month for the current month's usage and shall be subject to full performance of the customer's obligations under the contract. The Volume Use Discount is not part of the pricing structure of UCS Services and is subject to change or may be discontinued without notice.

NATIONAL DATACENTER SERVICES

File Unloading and Loading

File unloading and loading to permanent storage are charged at UCS Local and Remote Batch Service Rates. File reloading from Datacenter Back-Up Tapes is charged at \$15.00 per file + \$.10 per 1,280 characters; maximum charge is \$60.00.

Miscellaneous Services

Central Site I/O Charges:

\$2.00 per 1000 cards read	\$4.00 per 1000 lines printed (4-part paper)
2.00 per 1000 lines printed (1-part paper)	3.00 per 250 cards punched
2.50 per 1000 lines printed (2-part paper)	

Interpretation of punched cards	—\$10.00 per hour; —\$ 5.00 minimum	Tape Purchase	—\$25.00 per tape
Decollating and Bursting	—\$10.00 per hour; —\$ 5.00 minimum	Tape Storage	—\$ 5.00 per tape per month
Dayfile Searches	—\$50.00 per requested day	Tape Rental	—\$ 7.00 per tape per month
Card Storage	—\$2.00/month per 2,000 card box.	Tape Mounting	—\$ 2.00 per reel mounted.
Magnetic Tape Conversion	—\$50.00 per reel		
Mailing	—Postage plus 20%; \$3.00 minimum; or \$10.00 per hour for handling on shipments sent "collect."		

Professional Services

Senior Analyst*	\$50.00/hour
Analyst*	\$40.00/hour
Operator	\$30.00/hour

*four hour minimum

Plus travel and living expenses when required

Computer Output Microfilm (COM)

COM is a special service performed off-line after the UCS APEX System has generated the COM formatted tape. The charge for this special service does not apply to the monthly minimum computer service charge.

COM Prices

16MM Roll Originals	\$17.00 per 1000 Frames
16MM Roll Copies	\$10.00 per 100 ft. Roll
Fiche Originals	\$13.00 per 1000 Frames
Fiche Copies	\$.40 per Fiche

Miscellaneous

Fiche Break	\$ 1.00 each
Other COM Services	Company Cost + 25%
Delivery	Company Cost + 25%
COM Service Minimum	\$10.00 per Job

Plotting Services

\$1.10 per Plot Service Unit (PSU)

The Plot Service Unit is a unit of measurement of plotter resources used during the actual processing of the plot. The resources measured include actual plot time, paper and ink used. The charge for this special service does not apply to the monthly minimum computer service charge.

Paper charges:

.22 PSU per foot of 36" paper*
.07 PSU per foot of 15" paper*

*Paper charges are for standard white or grid translucent paper only.

Minimum charges:

2 PSU minimum charge for ballpoint ink plots
6 PSU minimum charge for liquid ink plots

A surcharge of 10% will be applied to all liquid ink plots.

Service Schedule:

Weekdays: 8:00 a.m. thru 5:00 p.m. Central Time, Monday thru Friday. Priority will be given for all plots of less than 30 minutes duration. Plots submitted after 3:00 p.m. will be processed the next day. A service limit of three plot hours per day per customer may be necessary to ensure 24 hour turnaround. Plots will be processed and mailed within 24 hours.

Weekends: Plots submitted after 3:00 p.m. Friday will be processed and mailed by the following Tuesday.

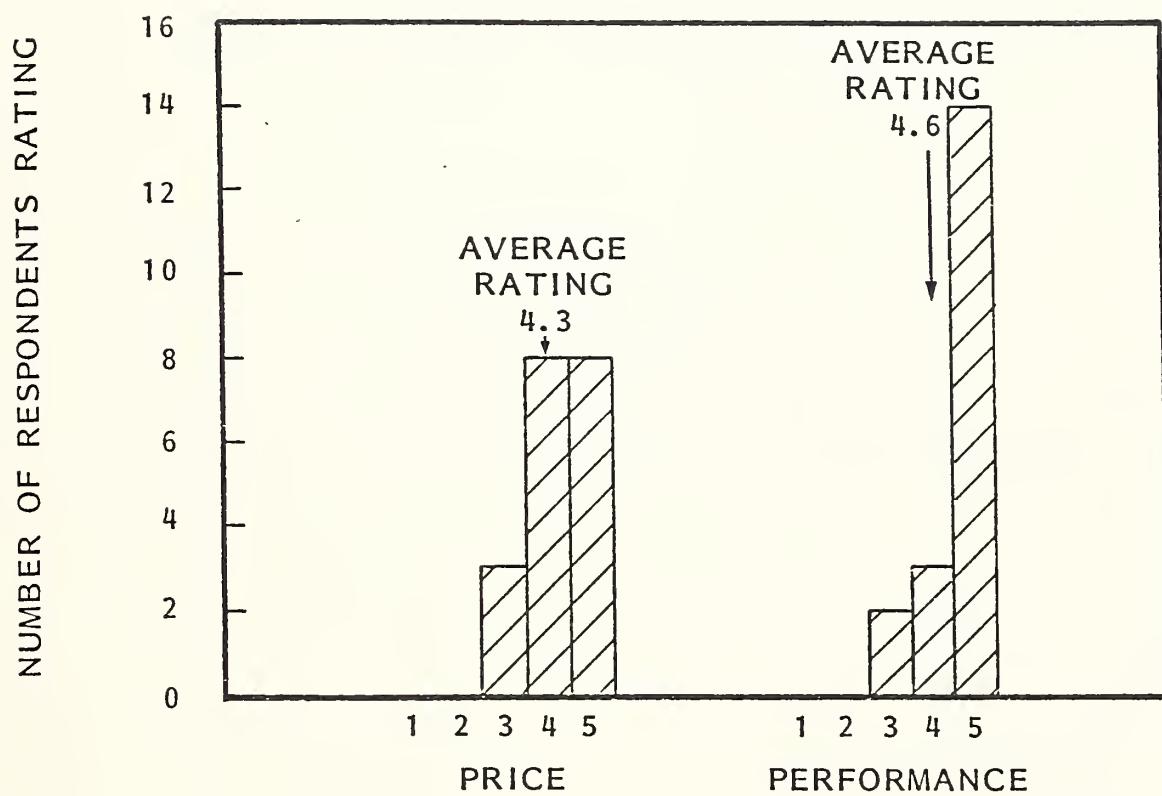
Standard Options:

Paper	-15 and 36 inches; white translucent and olive green grid (10 lines per inch)
Liquid Ink	-Red, blue, black and green
Ballpoint	-Red, blue, black and green

PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE



USERS' RATINGS OF THE
RELATIVE IMPORTANCE OF
PRICE VERSUS PERFORMANCE
OF CYBER SERVICES



NOTE: RATED ON A SCALE OF 1 TO 5, WHERE 1 IS LEAST IMPORTANT AND 5 IS OF VITAL IMPORTANCE.

PRICING CHANGES

- INTERACTIVE PROCESSING

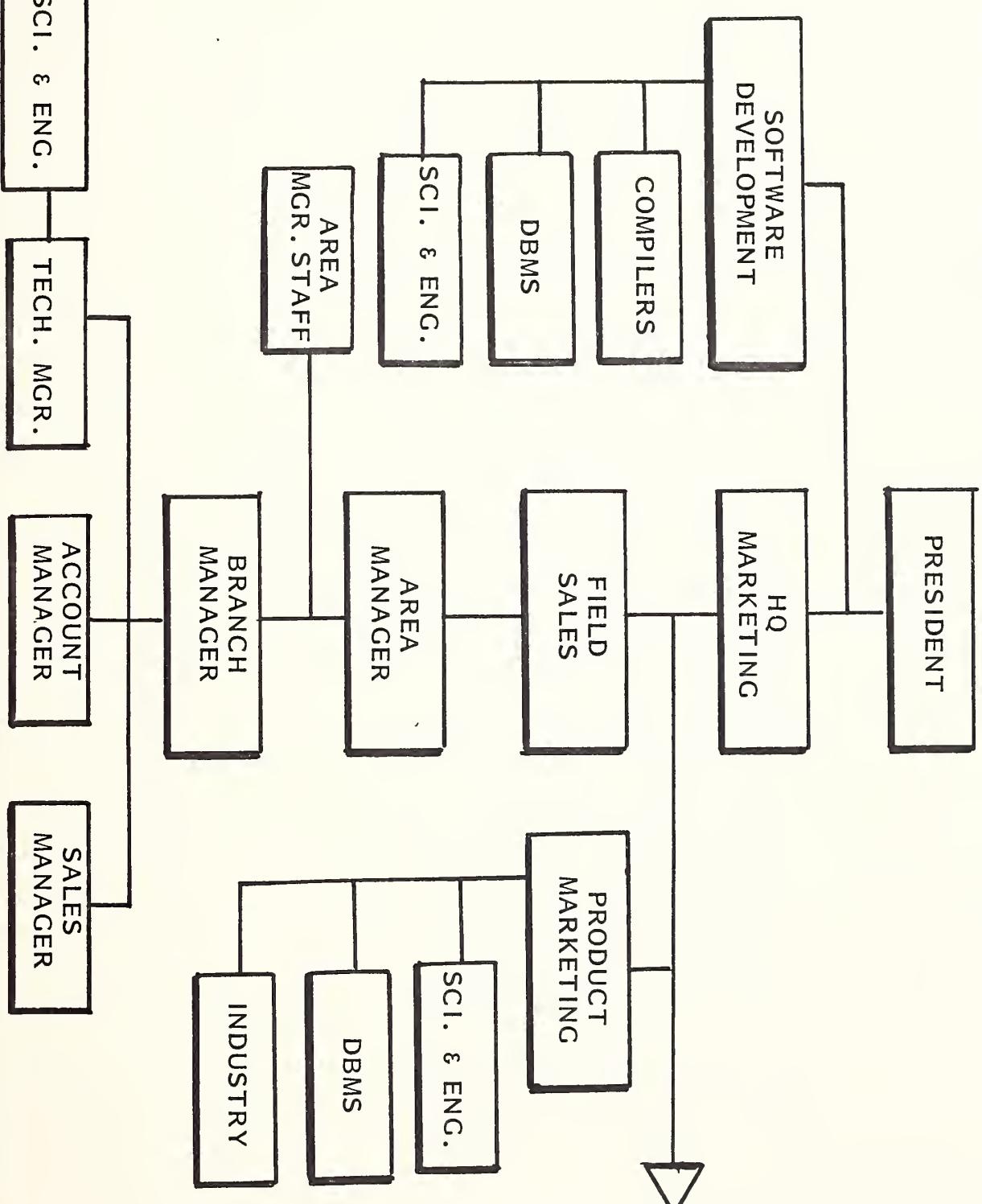
- AVERAGE INCREASE PER YEAR 1978 - 1980 4.4%
- . EXCLUDING VENDORS WHICH DECREASED 6.5%
- AVERAGE INCREASE PER YEAR 1981 - 1982 4.8%
- . EXCLUDING VENDORS WHICH DECREASED 6.7%

- REMOTE BATCH PROCESSING

- AVERAGE INCREASE PER YEAR 1978 - 1980 4.1%
- AVERAGE INCREASE PER YEAR 1981 - 1982 3.4%
- MOST PRICE-SENSITIVE OF RCS DELIVERY MODES

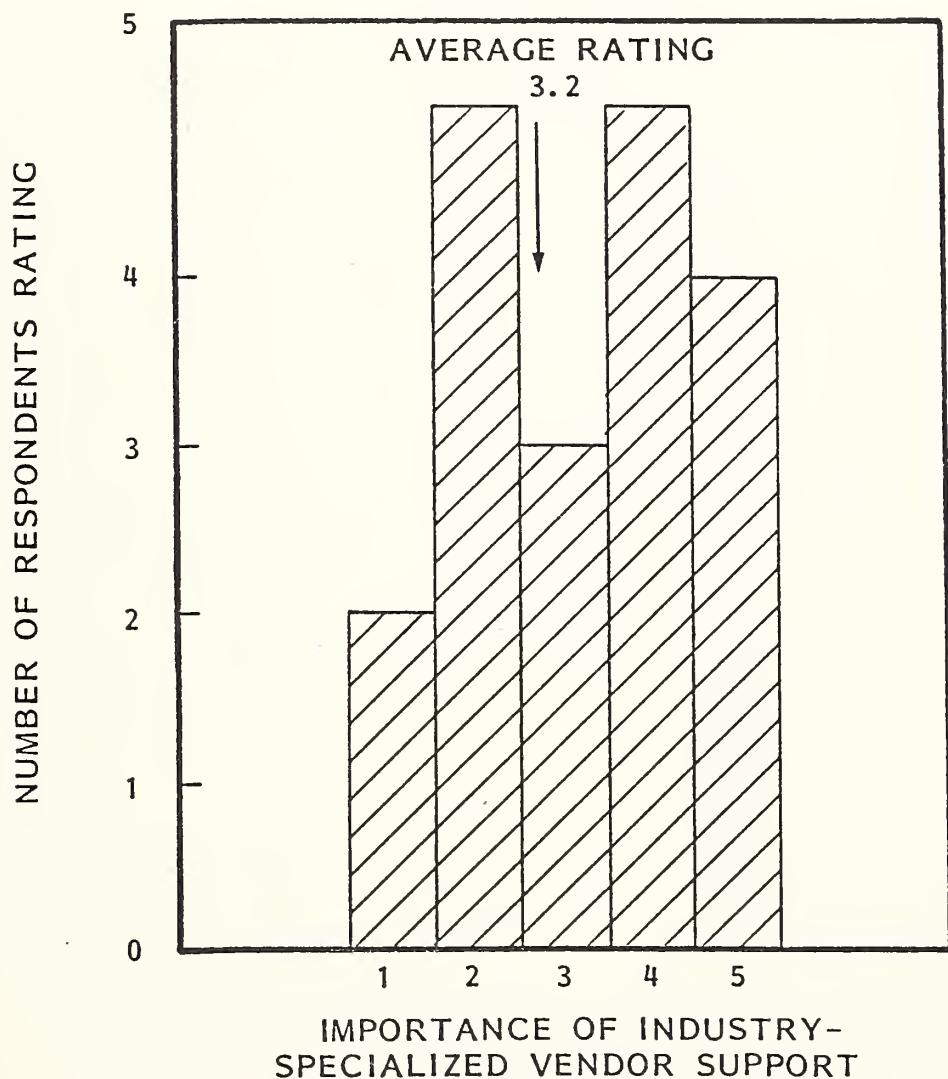
INPUT

VENDOR SALES AND SUPPORT ORGANIZATION



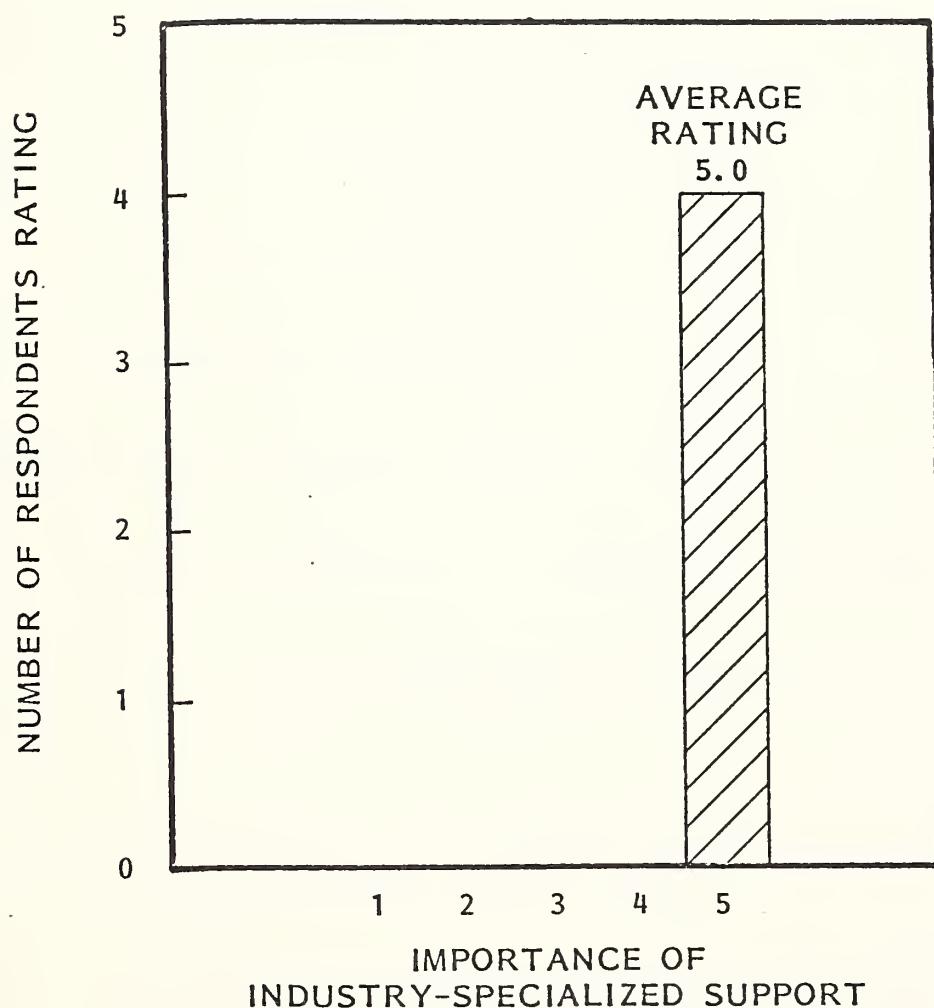
INPUT

USERS' RATINGS OF THE IMPORTANCE
OF HAVING ACCESS TO INDUSTRY-SPECIALIZED
VENDOR SUPPORT



NOTE: RATED ON A SCALE OF 1 TO 5, WHERE 1 IS NOT ESSENTIAL
AND 5 IS VITAL.

VENDORS' RATINGS OF THE IMPORTANCE OF
PROVIDING INDUSTRY-SPECIALIZED
SYSTEMS ANALYSTS IN MARKETING
CYBER SERVICES



NOTE: RATED ON A SCALE OF 1 TO 5, WHERE 1 IS NOT ESSENTIAL AND 5 IS VITAL.

**PROFITABILITY ANALYSIS OF
SCIENTIFIC AND ENGINEERING BUSINESS**

- REVENUE SOURCES.
 - MACHINE RESOURCES.
 - PROFESSIONAL SERVICES.
 - DOCUMENTATION.
 - SEMINARS/TRAINING.
- ADDITIONAL EXPENSES FOR RCS VENDORS.
 - ROYALTY PAYMENTS TO SOFTWARE SUPPLIER.
 - . 75/25 SUPPLIER/RCS VENDOR SPLIT OF PREMIUM CHARGE.
 - DEVELOPMENT AND OPERATIONS STAFF TO MAINTAIN CDC HARDWARE/SOFTWARE.
 - CUSTOMER SUPPORT STAFF SPECIALIZING IN S&E DISCIPLINES.

INPUT

USER ANALYSIS AND REQUIREMENTS

INPUT

REASONS FOR USING AN OUTSIDE SERVICE

- TO JUSTIFY DEMAND FOR AN IN-HOUSE SYSTEM
- IMPROVE PRODUCTIVITY
- IMPROVE TURN-AROUND.
- ARRAY OR MATRIX PROCESSING USED IN DESIGN OF
LARGE STRUCTURES
 - APPROXIMATELY 25% OF PROCESSING
- EXTENDED CORE STORAGE
 - 2-6 MILLION BYTES OF CORE

INPUT

REASONS FOR USING AN OUTSIDE SERVICE (CONT.)

- COST-EFFICIENCY OF BUYING RATHER THAN DEVELOPING SCIENTIFIC AND ENGINEERING SOFTWARE
- LACK OF IN-HOUSE PERSONNEL TO PERFORM SOFTWARE DEVELOPMENT
- LACK OF IN-HOUSE EXPERTISE TO DEVELOP THE SOFTWARE
- ENGINEERING APPLICATION REQUIREMENTS ARE GIVEN SECOND PRIORITY TO GENERAL BUSINESS APPLICATIONS

INPUT

MOST IMPORTANT FEATURES OF CYBER SERVICES

USERS

- ACCURACY OF A 60-BIT MACHINE
- PRICE/PERFORMANCE
- PROCESSING CAPABILITY
- APPLICATIONS SOFTWARE
- EASE OF USE
- EXTENDED CORE
- VENDOR SUPPLIED, INDUSTRY SPECIALIZED SUPPORT

VENDORS

- PROCESSING CAPABILITY
- INDUSTRY-SPECIALIZED SUPPORT
- PRICE PERFORMANCE
- APPLICATION SOFTWARE
- ACCURACY OF A 60-BIT MACHINE
- EASE OF USE
- EXTENDED CORE

- VENDOR AND USERS DIFFER ON IMPORTANCE OF INDUSTRY-SPECIALIZED SUPPORT
 - USERS NOT INTERESTED IN PAYING HIGHER PRICES FOR BUNDLED SERVICES

INPUT

PROCUREMENT PROCESS

- NEED IS ESTABLISHED BY END USERS
- VENDORS ARE QUALIFIED BY END USERS, AND ENGINEERING LINE MANAGEMENT
- BIDS ARE SOLICITED
- ENGINEERING DEPARTMENT BENCHMARKS THE VENDOR
- BIDS ARE REVIEWED BY A STEERING COMMITTEE COMPOSED OF ENGINEERING LINE MANAGEMENT, DP MANAGER AND THE CONTROLLER
- PURCHASE RECOMMENDATION IS APPROVED BY CORPORATE MANAGEMENT

INPUT

**RESPONSIBILITIES IN THE BUYING
PROCESS FOR CYBER SERVICES, AS
REPORTED BY BOTH USERS AND VENDORS**

ORGANIZATION	EVALUATION	PURCHASE RECOMMENDATION	PURCHASE DECISION	FINAL APPROVAL
END USER	/	/		
LINE MANAGEMENT	/	/	/	
DATA PROCESSING
FINANCIAL DEPARTMENT				
CORPORATE MANAGEMENT			/	/

= NOT INVOLVED

= DIRECTLY INVOLVED

= MIXED RESPONSES FROM VENDORS

VARIATIONS OF PROCUREMENT PROCESS

- 37,000 ENGINEERING AND ARCHITECTURAL SERVICES ESTABLISHMENTS
 - USER IS ALSO THE OWNER OF THE COMPANY, WHO CONTROLS THE PURCHASE DECISION COMPLETELY
 - MANAGER OF ENGINEERING CONTROLS THE ENTIRE PROCESS
 - PROJECT MANAGER HAS CONTROL OVER HIS OWN BUDGET

INPUT

VARIATIONS OF PROCUREMENT PROCESS (CONT.)

- FEDERAL GOVERNMENT PROCUREMENT
 - TELEPROCESSING SERVICES (TSP) VIA GENERAL SERVICES ADMINISTRATION (GSA)
 - PROCUREMENTS BASED UPON QUALIFIED VENDOR LIST AND LOWEST COST TO END-USER
 - VALUE ADDED PRODUCTS ARE GENERALLY NOT THE BASIS FOR VENDOR SELECTION
 - MANDATORY SOFTWARE CERTIFICATION
 - COMPLY WITH FEDERAL INFORMATION PROCESSING STANDARDS
 - SOLE SOURCE PROCUREMENT

INPUT

DURATION OF PROCUREMENT PROCESS

- AVERAGE DURATION FROM TIME THE NEED WAS JUST DETERMINED TO THE TIME OF ISSUANCE OF A PURCHASE ORDER
 - THREE MONTHS
- SPREAD IS FROM ONE TO SIX MONTHS

INPUT

**TYPICAL JOB TITLES OF PROSPECTIVE
BUYERS OF CYBER SERVICES**

- PROJECT ENGINEER
- RESEARCH ENGINEER
- MANAGER, ENGINEERING COMPUTING
- CHIEF ENGINEER
- MANAGER, SCIENTIFIC COMPUTING
- MANAGER, RESEARCH AND DEVELOPMENT
- VICE PRESIDENT, ENGINEERING

INPUT

AVERAGE MONTHLY EXPENDITURES FOR CYBER SERVICES

- \$22,000
- AVERAGE EXPENDITURE PER END-USER \$1,300
 - AVERAGE NUMBER OF USERS 17
 - AVERAGE NUMBER OF USERS REPORTED BY VENDORS 40

INPUT

TYPICAL COMMENTS BY CYBER SERVICES USERS

- "CYBER COMPUTERS ARE THE ONLY POSSIBLE SOLUTION"
- "OTHER MACHINES COULD NOT SOLVE OUR PROBLEMS"
- "OUR ANALYSIS CODES REQUIRE 60-BIT PRECISION,
WHICH THE IBM 4341 DOES NOT PROVIDE."
- "IBM IS OUT OF THE QUESTION, IT IS JUST NOT AN
ENGINEERING SYSTEM."
- "CRAY IS A GOOD SYSTEM, BUT IT IS JUST NOT
COST EFFECTIVE."
- "UNIVAC IS USELESS FOR OUR PURPOSES."

INPUT

FIELDS IN WHICH USER RESPONDENTS WORK

FIELD	PERCENT
SCIENTIFIC	27%
ENGINEERING	54
BUSINESS	11
DATA PROCESSING	8
TOTAL	100%

FACTORS INFLUENCING CONVERSION TO IN-HOUSE SERVICES

- ANNUAL RCS EXPENDITURES REACH COST THRESHOLD.
 - THREE-HUNDRED THOUSAND DOLLARS (\$300,000) TO \$500,000.
- UNDER UTILIZATION OF IN-HOUSE MACHINE RESOURCES.
- OUTSIDE EXPENDITURES INCLUDED IN DP MANAGEMENT JUSTIFICATION FOR NEW COMPUTER.
- USER STRATEGY TO COMPLY WITH CORPORATE MANAGEMENT DIRECTIONS/POLICIES.
 - RIGHT OF FIRST REFUSAL.

INPUT

SOFTWARE PORTABILITY

- MAJORITY OF VENDOR SUPPLIED SCIENTIFIC AND ENGINEERING SOFTWARE IS AVAILABLE FROM THIRD PARTIES.
 - PUBLIC DOMAIN.
 - INDUSTRY ASSOCIATIONS.
 - SOFTWARE PRODUCT VENDORS.
- STANDARD PROGRAMMING LANGUAGES USED.
- DOMINANT PACKAGES WRITTEN FOR MULTIPLE MAINFRAMES.

INPUT

DOMINANT TRENDS

- PRODUCTS
- MARKETING
- SUPPORT
- PRICING

INPUT

DOMINANT MARKETING TRENDS

- INDEPENDENT RCS VENDORS WILL DE-EMPHASIZE THE SCIENTIFIC AND ENGINEERING MARKETPLACE.
- VENDORS RESOURCES WILL BE ALLOCATED TO DEFEND TRADITIONAL BUSINESS APPLICATION AREAS.
 - DBMS.
 - FINANCIAL ANALYSIS AND PLANNING.
 - INDUSTRY SPECIALIZED APPLICATIONS.
- IN-HOUSE COMPETITIVE FORCES WILL DRIVE SCIENTIFIC AND ENGINEERING VENDORS INTO INDUSTRY SPECIALIZATION.
 - MANUFACTURING.
 - FEDERAL GOVERNMENT.
 - MEDICAL.
 - SERVICES.

INPUT

DOMINANT MARKETING TRENDS - continued

- VENDOR MARKETING STRATEGIES WILL BE BASED UPON PROVIDING ACCESS TO LARGE SCIENTIFIC MAINFRAMES.
 - CDC.
 - CRAY.

INPUT

DOMINANT PRODUCT TRENDS

- RCS VENDORS WILL SEEK EXCLUSIVE MARKETING RIGHTS FROM SOFTWARE SUPPLIERS.
 - FUND PROPRIETARY ENHANCEMENTS.
 - SOURCE CODE WILL NOT BE AVAILABLE.
- FILE MANAGEMENT OF ENGINEERING DATA WILL EVOLVE TOWARDS DATA BASE MANAGEMENT.
 - DATA INDEPENDENCE.
 - DATA INTEGRITY.
- ENGINEERING SOFTWARE DEVELOPMENT WILL CONTINUE TO RESIDE OUTSIDE OF THE RCS. VENDOR.
 - SOFTWARE PRODUCT COMPANIES.
 - ASSOCIATIONS.
 - UNIVERSITIES.
 - PUBLIC DOMAIN VIA GOVERNMENT RESEARCH GRANTS.

INPUT

DOMINANT PRODUCT TRENDS - continued

- STRUCTURAL DESIGN ANALYSIS WILL REMAIN AS THE MOST IMPORTANT APPLICATION AREA FOR RCS VENDORS.

INPUT

DOMINANT PRICING TRENDS

- RESOURCE PRICING WILL EVOLVE TO A FIXED PRICE/PORT METHODOLOGY FOR MAJOR CLIENTS.
- NON-PRIME TIME DISCOUNTS WILL REMAIN UNCHANGED TO PROTECT PRIME TIME RATES.

INPUT

DOMINANT SUPPORT TRENDS

- HEADQUARTERS AND FIELD SUPPORT OF SCIENTIFIC AND ENGINEERING APPLICATIONS WILL DEPEND UPON VENDOR REVENUE OBJECTIVES AND BUSINESS STRATEGIES.
 - CDC CYBERNET HAS CREATED WALK-IN TECHNOLOGY CENTERS.
 - CSC IS WITHDRAWING FROM THE MARKET.
- CDC HAS INTEGRATED PLATO INTO CYBERNET TO PROVIDE ENGINEERING USERS WITH COMPUTER-AIDED INSTRUCTIONS TO OPERATE SOFTWARE PRODUCTS.

INPUT

UNMET NEEDS

- TECHNOLOGY ADVANCES.
 - GENETIC.
 - ROBOTICS.
- REINDUSTRIALIZATION OF FACTORIES.
 - PROCESS SYSTEM MODELING.
- FOREIGN COMPETITION.
 - ENGINEERING DEMAND.
- FEDERAL GOVERNMENT.
 - INCREASED DEFENSE EXPENDITURES.

INPUT

